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MEDICAL

JUL 21 1933

VOLUME 46 NUMBER 1

AMERICAN JOURNAL

OF

DISEASES OF CHILDREN

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JULY, 1933

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO, ILLINOIS. ANNUAL SUBSCRIPTION, $8.00

Entered as Second-Class Matter, January 4, 1911, at the Postoffice at Chicago, Illinois, Under Act of Congress of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on June 14, 1918.

CONTENTS OF PREVIOUS NUMBER

JUNE, 1933. NUMBER 6

Thrombosis of the Dural Venous Sinuses in Infancy and in Childhood. R. K. Byers, M.D., and G. M. Hass, M.D., Boston.

Acute Rheumatism as a Familial Disease. Edith Irvine-Jones, M.B., Ch.B., St. Louis.

Lungs After Treatment of Asphyxia Neonatorum in the Drinker Respirator: Report of Thirty Necropsies. Douglas P. Murphy, M.D., and John T. Bauer, M.D., Philadelphia.

Standards of Basal Metabolism for Children of Retarded Growth. Anne Topper, M.D., New York.

The Intestine and Urinary Bladder in Poliomyelitis. John A. Toomey, M.D., Cleveland.

Chemical Allergy and Nirvanol Sickness: Preliminary Report. Béla Schick, M.D.; Harry Sobotka, Ph.D., and Samuel Peck, M.D., New York.

Constipation of Infancy: The Rectal Factor. Herbert I. Kallet, M.D., Detroit.

Infants Born of Women Having Toxemia as a Complication of Pregnancy. George Craig Ludlow, M.D., New York.

Cutaneous Reaction to Tuberculin in Primary Pulmonary Tuberculosis: Growth and Variability of Surface Area. C. A. Stewart, M.D., Ph.D., Minneapolis.

Blood Cultures in Children with Rheumatic Fever. May G. Wilson, M.D., and Helen Edmond, New York.

Case Reports:

Congenital Heart Disease: Atresia of the Tricuspid Orifice. Samuel Bellet, M.D., and Harold L. Stewart, M.D., Philadelphia.

Coarctation of the Aorta: Anomaly of Great Vessels of Neck and Intermittent Leakage of a Cerebral Aneurysm Diagnosed During Life. H. H. Lichtenberg, M.D., Chicago, and H. F. Gallagher, M.D., Los Angeles.

"Double Appendix" Associated with Other Congenital Anomalies. Henry N. Pratt, M.D., Boston.

Progress in Pediatrics:

Periarteritis Nodosa in Infancy and in Childhood: Report of Two Cases with Necropsy Observations; Abstracts of Cases in the Literature. Jacob L. Rothstein, M.D., and Sara Welt, M.D., New York.

Pediatric Biographies:

Joseph Raulin. John Ruhräh, M.D., Baltimore.

Pediatrics in Art:

Pituitary Disturbance: Gigantism. John Ruhräh, M.D., Baltimore.

News and Comment.

Abstracts from Current Literature.

Society Transactions:

University of Michigan Pediatric and Infectious Disease Society.

Chicago Pediatric Society.

Book Reviews.

Directory of Pediatric Societies.

General Index.

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American Journal of Diseases of Children

VOLUME 46 JULY, 1933 NUMBER 1

INTERPRETATION OF SOME RECENT ADVANCES IN MEDICINE IN TERMS OF EQUILIBRIUM

OSCAR M. SCHLOSS, M.D.

NEW YORK

The past two and one-half decades have brought revolutionary changes in medicine. A number of us can remember clearly when a blood count was a highly scientific procedure and when the number of physical and chemical measurements designed to elucidate the manifestations of disease or even to be employed in research was limited, and viewed from the standpoint of the present-day superiority those methods were of questionable utility. So rapidly and yet so insidiously has the situation changed that it is difficult to trace even approximately the steps that have led up to the present position. One by one methods have been devised to supply data from physical and chemical analysis of body fluids and secretions or from biologic experiments; the application of these methods has served to produce an enormous literature the volume of which is ever increasing in almost geometric progression.

To attempt to analyze the factors responsible for this expansion of medical literature would involve a discussion which would carry me far from the purpose of this address, but I think every one will agree that the most potent and indeed the ultimate influence has been incident to the golden age from which we, alas unfortunately, have been so rudely precipitated. Large numbers of subsidized institutions offering rare opportunities and visions of accomplishment have drawn students bent on scholarly pursuits and the satisfaction of intellectual curiosity. It is due largely to such inspiration that all of the substantial advances have been made, but one must admit, even though reluctantly, that contributors of this type are not solely responsible for the magnitude of the present output of medical literature. Advancement, both academic and material, has unfortunately come to depend in too large a measure on publication, and the search for material to serve as the basis for a paper or two has assumed an importance entirely incommensurate with advantage to any one except the persons directly concerned.

Presidential address delivered before the American Pediatric Society, May 8, 1933, Washington, D. C.

I hope that it is unnecessary for me to disclaim any intention to belittle the importance or usefulness of careful observations or accurate measurements, even though they may present no immediate solution of the perplexing problems of disease. We all know too well that the solution of such problems may draw heavily on data which, as originally presented, could be considered only academic or abstract. But what I have attempted to lead up to is the self-evident and well recognized principle that the ultimate goal of all biologic investigation is to coordinate and correlate observations and measurements so that they may be expressed in definite terms of physiology or of disease. And it would take much to dissuade me from the belief that disregard of this principle has led to a large literature of single, uncoordinated measurements applied almost without purpose to a number of diseases, thereby increasing literary output in no way commensurate with expense, time or intellectual effort. And so, at any rate, there have been built up in medicine, and I use the term in its broadest biologic sense, different fields of knowledge and endeavor, some isolated, others more or less coordinated, but each with its specialized technic and large literature, the complete mastery of all being quite beyond the intellectual capacity of any ordinary person.

Despite these self-evident criticisms and in outstanding contrast, refinement of methods and carefully devised investigations have added knowledge of immediate practical value and point the way to significant and enlightening advancement of biologic thought. Concepts of physiologic processes are being built up bit by bit which give to present-day medicine a fascination undreamed of a few years ago, and their very incompleteness and complexity offer a challenge which cannot fail to stimulate both imagination and endeavor.

Viewed broadly, it would seem that one of the most significant and far-reaching results of this recent extension of medical knowledge is the gradually increasing ability to coordinate observations in such fashion that they may be translated directly in terms of balance or equilibrium. Considering, even under normal conditions, the flow of influences changing or tending to change the concrete structure or function of physiologic systems, it is only too evident that measurements at a given time reveal merely the state of balance of the system involved. All organic structures and physiologic mechanisms are subject repeatedly to destructive and constructive forces, the balance of which may determine the state and degree of health or disease. It seems not improbable that real understanding of physiologic processes, their mechanisms and distortions can ultimately be appraised only by the extent to which one is able to dissect and to visualize the factors which contribute to their equilibration. Owing to increase of accurate methods

and elaboration of modes of biologic experiment, one can now at least conceive, though perhaps only vaguely, the possibility of elucidating the forces which establish such equilibria and the compensations through which they are preserved. The term "equilibrium," or "balance," is used to designate the resultant of synergistic and antagonistic forces of separate and interrelated systems which establish the level of function at a given time. Equilibrium in this sense embraces but is more comprehensive than the purely defensive type of physiologic mechanism described by Canon as homeostatic.

Perhaps the most pertinent and illuminating example that I could select is the acid-base and electrolyte equilibrium of the body fluids, its importance emphasized by the far-reaching and varied effects of its disruption. Here is a delicately balanced system preserved by the ability of the lung to eliminate a volatile acid, the ability of the kidney to form an organic base and to conserve base by eliminating acid, the ability of the intestinal tract to absorb acid and reject base, and of paramount importance, as shown by Gamble, the ability of the organism, through the phenomenon of selective excretion, to utilize sodium chloride as either acid or base. And thus, as roughly indicated, the acid-base mechanism regulated to compensate repeated disrupting influences of metabolism or environment remains unaltered within physiologic limits unless confronted too suddenly by inordinate demands or burdened by the failure of compensatory mechanisms. Only rarely does severe acidosis occur—except in the event of sudden failure of renal function due to an organic lesion or water depletion or the production of an overwhelming quantity of organic acid through faulty metabolism. Alkalosis of clinical importance is practically dependent on elimination of chloride too great to be compensated by chloride ingested or by that drawn from intrinsic stores.

But the electrolyte equilibrium of the blood has an influence far more diversified than the mere regulation of blood reaction. On its equilibrium is dependent, to some degree at least, the phenomena of ossification and neuromuscular sensitivity. Involved also in this equilibrium is the inverse relationship of calcium and phosphorus, which in itself furnishes an example of equilibrium of importance but about which much remains to be learned.

Related closely to electrolyte equilibrium, but dominated by and dominating other functions, is the problem of water balance, the disruption of which leads on one extreme to dehydration and on the other to edema. I am using the term "water" broadly, for, as shown by Gamble and his co-workers, water is not an isolated constituent of body fluids and cells. Water is the matrix for a definite chemical structure of dissolved substances, physiologically inseparable and forming the fluids of

the organism. A consideration of fluid balance brings in additional factors of importance, the osmotic pressure of the blood and interstitial fluid dependent largely on their protein content, the hydrostatic pressure of capillaries and interstitial tissue, vascular permeability and circulatory forces which influence the secretion of urine, all of which operate to establish a balance or equilibrium. Related also to water metabolism is the important function of the heat equilibration of the body.

Perhaps the most familiar, and, I am sure, one of the most perplexing disturbances of balance is the phenomenon of fever. It is almost banal to state that fever represents a disturbance in the balance of heat production and heat elimination. This must be true, but despite the fact that there is much information concerning the caloric balance in health, a number of factors remain to be appraised before the disturbances leading to fever can be even imperfectly understood. Reasoning from available information, one must conclude that heat dissipation, its mechanism and lability, is perhaps the most important factor involved in the preservation of normal body temperature. That a mere interference with cutaneous heat loss through evaporation, radiation and conduction may produce fever is clearly established by the work of many investigators on salt, protein or dehydration fever. In states of fever involving increased heat production such as usually occurs in infections, insufficient heat loss is a factor of demonstrable importance. In illustration, one need only refer to Du Bois' experiment in which a malarial chill was imitated as nearly as possible by a normal person. Excessive heat was produced through voluntary shivering which compared favorably with the heat production of the malarial patient, but the healthy man eliminated an increased amount of heat, thus preserving equilibrium and normal temperature. Owing to failure of heat loss to keep pace with heat production, the malarial patient retained heat and fever resulted.

It would seem, therefore, that a satisfactory understanding of heat equilibrium and fever must depend to a considerable degree on a more intimate knowledge of the regulation and mechanism of heat loss. To accept tacitly Liebermeister's theory that fever is determined merely by a higher setting of the heat-regulating mechanism leaves too much to be explained.

The concept which I have attempted to elucidate can be further exemplified by a brief reference to the coordination of function of some of the glands of internal secretion. Much of what has been learned recently concerning the interrelation of these organs has long been suspected, but the whole subject has been so hopelessly involved in a maze of conjecture and fancy that orientation seemed almost

impossible. During the past few years, however, intensive work by a number of observers has brought to light evidences of equilibrium of far-reaching physiologic importance. Much of what has been learned, it is true, supplies only in a fragmentary way the information needed to complete the picture, but even this knowledge has permitted the subject to emerge from the realm of medical mythology into one of concrete thought and endeavor. Much recent knowledge of the function of the endocrine glands concerns growth and development, and it seems not improbable, as has long been hinted, that normal development may depend largely on a nice balance of hormonal function of the pituitary, the thyroid and the suprarenal cortex, with later participation of the gonads. A primary alteration of structure or of function of any one gland may be reflected in turn in altered function or structure of the remaining glands. This sequence may lead to a train of events eventuating in stigmas of abnormal growth and development.

One need only mention the atrophic changes in the thyroid, the suprarenal, and the gonads after removal of the hypophysis and, of equal importance, that implants of pituitary gland not only relieve the cachexia, but also lead to repair of the atropic changes in the other glands. The relation of suprarenal cortex to the gonads, the development of secondary sex characteristics, both physical and functional, and the effect of myxedema on the gonads are too well known to require detailed recital. That these interrelations are not without significance in human pathologic conditions is evidenced by the glandular changes observed in acromegaly, adenoma of the pituitary gland and the hypophyseal cachexia of Simmonds' disease. Of interest in this connection is the familiar example of the absence of suprarenal glands in the anencephalic monster in which the pituitary gland has not developed. It is possible, in the light of recent experiments, that the difficulties of reconciling the manifestations of exophthalmic goiter with pure overfunction of the thyroid gland may be due to the fact that the hypertrophy of the thyroid gland is not wholly primary, but may be the result of pituitary stimulation.

Many observations proclaim also the dependence of primary sex characteristics on the equilibrium of the endocrine glands. In this connection, the demonstrated function of the pituitary gland in promoting descent of the testes is of interest. The fact that of all mammals only man shows the presence of the pituitary hormone in the blood throughout gestation may be correlated with the fact that man is the only animal with testes descended at birth.

No one can suppose for a moment that the coordinative functions of the endocrine glands are as restricted as intimated. A familiar example is the influence of the endocrine glands on carbohydrate metabolism,

which is probably dictated by more far-reaching influences than the internal secretion of the pancreas and of the pituitary and suprarenal glands. Again, the parathyroid gland is probably concerned in an equilibrium involving at least the regulation of calcium and phosphorus, and one can hardly doubt the existence of this equilibrium, though the evidence available leaves much to speculation. It would indeed be nothing short of remarkable if the parathyroid gland existed merely to cause bone destruction and hypercalcemia by hypertrophy and to lead to tetany when removed.

There is evidence, also, that the endocrine glands have influence on equilibria with which they have at present no clearly demonstrable relationship. This is hinted by the electrolyte changes in the blood following removal of the suprarenal cortex. The recent observations of Loeb that by feeding sodium chloride these changes may be repaired, temporarily at least, in patients afflicted with Addison's disease, and also in the suprarenalectomized animal, may prove of more far-reaching importance than is now evident. Of similar significance and perhaps even more fascinating are the observations of Szent-Gyorgyi, King and Waugh, and Quick on the chemical nature of vitamin C and its storage in the suprarenal cortex, from which it disappears during experimental scurvy. Much could be said also of balance as it refers to the autonomic nervous system both as to the interplay of the sympathetic and parasympathetic divisions in the regulation of vegetative functions and of the interrelation with the glands of internal secretion. And if I were so minded, numerous other evidences of balance or equilibrium could be cited to implicate more than the chemical structure of the organism or the hormonal control of nerve and glandular function. Practical understanding of a number of obscure diseases of the blood can be achieved only when an insight is gained into the forces involved in the formation and destruction of its formed elements. Phenomena concerned in resistance and immunity, also implicating allergy and its relation to immunity, undoubtedly will furnish pertinent examples of equilibrium. But further elaboration of this subject by citation of examples offers little profit, for its dominant theme is too simple and self-evident for this to be necessary.

From a philosophic point of view, the concept of balance or equilibrium may be extended greatly beyond the consideration of isolated systems and uncoordinated functions. It seems probable that efficient structure, proper function and even the existence of the organism are dependent on the correlation of numerous equilibria which viewed narrowly are distinct, but which are actually and essentially all closely interrelated to form an effective and viable physiologic mechanism.

SOY BEAN FLOUR IN INFANT FEEDING

A STUDY OF THE RELATION OF THE COMPARATIVE INTAKES OF NITROGEN, CALCIUM AND PHOSPHORUS ON THE EXCRETION AND RETENTION OF THESE ELEMENTS BY INFANTS

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WITH THE TECHNICAL ASSISTANCE OF
MARTHA J. OELKE, M.S.; JOHN B. MCKINLEY, B.A., AND EVA A. GOFF, B.A.
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The institution of a milk-free diet is sometimes considered desirable for infants who exhibit an allergic response to milk protein. The use of soy bean flour in these diets has been advocated. The advantages of soy beans in infant feeding have been discussed by Tso [1] and by Hill and Stuart.[2] Soy bean flour is rich in protein, but the protein is of poorer quality than milk protein, and consequently must be fed at a higher level, from 20 to 22 per cent of the total calories.[3] The mineral content of soy bean flour differs considerably from that of milk.[2] Soy beans are rich in potassium and magnesium, but contain very little sodium, calcium and chloride. The percentage of phosphorus is not very different from the percentage of phosphorus in milk solids. In feeding soy bean preparations to infants, it is customary to add sodium chloride and a source of calcium, usually the carbonate or lactate. The phosphorus content has been considered adequate.[4] The caloric value of the soy bean flour is increased by the addition of oil and sugar. Cod liver oil and a source of vitamin C also must be given.

From the Department of Pediatrics, College of Medicine, State University of Iowa.

The expense of this study was partially defrayed by a grant from Mead Johnson and Company.

1. (*a*) Tso, E.: The Development of an Infant Fed Eight Months on a Soy Bean Milk Diet, Chinese J. Physiol. **2**:33, 1928. (*b*) Tso, E.; Yee, M., and Chen, T.: The Nitrogen, Calcium and Phosphorus Metabolism in Infants Fed on Soy Bean "Milk," ibid. **2**:409, 1928. (*c*) Tso, E.: A Vegetable Milk Substitute for North China, Am. J. Physiol. **90**:542, 1929. (*d*) Chang, K. C., and Tso, E.: A Soluble Soy Bean Milk Powder and Its Adaptation to Infant Feeding, Chinese J. Physiol. **5**:199, 1931.

2. Hill, L. W., and Stuart, H. C.: A Soy Bean Food Preparation for Feeding Infants with Milk Idiosyncrasy, J. A. M. A. **93**:985 (Sept. 28) 1929.

3. Tso, E.: A Comparison of the Nutritive Properties of Soy Bean "Milk" and Cow's Milk, Chinese J. Physiol. **3**:353, 1929. Wan, S.: A Comparison of the Dietary Properties of "Soy Bean Milk" and Cow's Milk, ibid. **5**:355, 1931.

4. Hill, L. W.: Infantile Eczema, with Especial Reference to the Use of a Milk-Free Diet, J. A. M. A. **96**:1277 (April 18) 1931.

The present study was undertaken in order to determine the relative retentions of nitrogen, calcium and phosphorus by an infant given soy bean feedings, compared with the retentions observed when the same infant was fed milk. The first soy bean preparation used (soy

TABLE 1.—*Intakes and Retentions of Nitrogen, Calcium and Phosphorus of Baby D. H.*

Date and Diet	Age, Wks.	Weight, Kg.	Total Intake, Gm.	Excretion			Retention	
				Urine, Gm.	Feces, Gm.	Total, Gm.	Total, Gm.	Per Kg., Gm.
Nitrogen								
4/13/31 Evaporated milk	34	8.615	5.65	3.75	0.56	4.31	1.34	0.156
5/ 4/31 Soy bean diet I	37	8.700	5.36	3.28	0.82	4.10	1.26	0.134
5/18/31 Soy bean diet II	39	9.025	6.79	4.71	0.78	5.49	1.30	0.134
6/ 8/31 Soy bean diet II	42	9.030	7.06	4.63	0.80	5.43	1.63	0.180
7/28/31 Soy bean diet III	49	9.060	5.50	3.41	1.13	4.54	0.96	0.106
8/ 3/31 Soy bean diet III	50	8.97	6.19	3.33	1.12	4.45	1.74	0.194
Calcium								
Evaporated milk			1.040	0.023	0.696	0.719	0.321	0.037
Soy bean diet I			1.442	0.086	1.022	1.108	0.334	0.038
Soy bean diet II			1.638	0.212	1.069	1.281	0.357	0.039
Soy bean diet II			1.640	0.286	0.703	0.989	0.651	0.072
Soy bean diet III			1.918	0.018	1.620	1.638	0.280	0.031
Soy bean diet III			2.105	0.019	1.695	1.714	0.391	0.043
Phosphorus								
Evaporated milk			0.884	0.441	0.326	0.647	0.237	0.027
Soy bean diet I			0.520	0.029	0.342	0.371	0.149	0.017
Soy bean diet II			0.315	0.003	0.234	0.237	0.078	0.009
Soy bean diet II			0.328	0.003	0.152	0.155	0.173	0.019
Soy bean diet III			1.832	0.306	1.270	1.576	0.256	0.028
Soy bean diet III			2.009	0.499	1.190	1.689	0.320	0.036

Percentage Composition of Soy Bean Foods

Soy Bean Food I		Soy Bean Food II	
Soy bean flour	67.50	Soy bean flour (refined)	49.6
Barley flour	9.50	Cornstarch	24.0
Olive oil	18.95	Butter oil	23.0
Sodium chloride	1.35	Sodium chloride	0.8
Calcium carbonate	2.70	Calcium carbonate	2.7

Soy Bean Food III

Same as soy bean food I except that dicalcium phosphate (4.5) replaces calcium carbonate (2.7)

Diets

Evaporated Milk Diet: Evaporated milk, 465 cc.; 12 per cent corn syrup solution, 465 cc.; egg yolk, 1; orange juice, 60 Gm.; tomatoes, 60 Gm.; apricots, 60 Gm.; cod liver oil, 1 teaspoonful

Soy Bean Diet I: Soy bean food I, 140 Gm.; cane sugar, 60 Gm.; 5 per cent ferric citrate, 2 cc.; distilled water, 960 cc.; orange juice, 60 Gm.; tomatoes, 60 Gm.; apricots, 60 Gm.; cod liver oil, 1 teaspoonful

Soy Bean Diets II and III: Identical with soy bean diet I except for the substitution of soy bean foods II and III for soy bean food I

bean food I) was a commercial preparation which has been used for infant feeding in this country.[2] The other soy bean diets were modifications of the first.[5] The exact composition of the diets, together with the data obtained, is given in table 1.

Two infants with eczema were used as subjects. One (baby D. H.) was studied during a total of six periods. The retentions observed

5. Mead Johnson and Company, of Evansville, Ind., furnished all of the soy bean preparations used in this study.

with three different soy bean diets were compared with the retentions noted when the infant was given milk. The effects of only one diet were studied with the second child (M. E.).

The ward routine followed in the study has been described in a previous report.[6] The experimental periods were three days in length. The infants received the experimental diet for at least three days preceding the period of study. The following analytic methods were used: Nitrogen was determined by the Kjeldahl method; calcium by a modification of the McCrudden technic;[7] phosphorus according to the method of Fiske and Subbarow,[8] and fixed base[9] and sulphates[10] by the methods of Fiske. For the other analyses, the customary standard methods were employed.[11]

RESULTS AND COMMENT

Retention of Nitrogen, Calcium and Phosphorus.—The data concerning the excretion and retention of nitrogen, calcium and phosphorus are given in tables 1 to 3. The chief alterations in the diets, exclusive of differences in the quality of protein ingested, were the differing relationships in the comparative intakes of the aforementioned three elements. The nitrogen intake of baby D. H. did not differ greatly with the four diets studied. The intake of calcium was much increased during the periods of the soy bean feedings. The phosphorus intake when soy bean diets I and II were given was less than the intake during the control period of milk feeding. In the last two periods studied (soy bean diet III), the phosphorus intake was more than twice the amount ingested during the period of milk feeding.

The retention of nitrogen by baby D. H. showed some variation during the different periods of soy bean feedings, but the average retention was approximately the same as during the period of milk feeding. The retention of calcium also was as high as had been noted with the milk feeding. In one period (soy bean diet II, second study) a very high retention of calcium was observed. During the other

6. Jeans, P. C.; Stearns, G., and others: Growth and Retentions of Calcium, Phosphorus and Nitrogen of Infants Fed Evaporated Milk, Am. J. Dis. Child., this issue, p. 69.

7. McCrudden, F.: The Determination of Calcium in the Presence of Magnesium and Phosphates: The Determination of Calcium in Urine, J. Biol. Chem. **10**:187, 1911-1912.

8. Fiske, C. H., and Subbarow, Y.: The Colorimetric Determination of Phosphorus, J. Biol. Chem. **66**:375, 1925.

9. Fiske, C. H.: A Method for the Estimation of Total Base in Urine, J. Biol. Chem. **51**:55, 1922.

10. Fiske, C. H.: The Determination of Inorganic Sulfate, Total Sulfate, and Total Sulfur in Urine by the Benzidine Method, J. Biol. Chem. **47**:59, 1921.

11. Hawk, P. B., and Bergeim, O.: Practical Physiological Chemistry, ed. 10, Philadelphia, P. Blakiston's Son & Co., 1931.

periods, the increased intake was not accompanied by any marked increase in retention. The phosphorus retentions tended to follow the intake, especially when the intake was decreased.

The question arises as to whether the lower phosphorus retentions observed with soy bean diets I and II were sufficient for body needs in view of the relatively unchanged retentions of nitrogen and calcium. Phosphorus is utilized by the body, both in nitrogenous tissues and in the mineral matter of bone. To build normal body tissue, therefore, sufficient phosphorus must be retained to combine in the correct proportions with the nitrogen and calcium retained. The determination of the relative amounts of phosphorus necessary for nitrogen and calcium has been discussed in a previous publication.[12] A minimum

TABLE 2.—*Intakes and Retentions of Nitrogen, Calcium and Phosphorus of Baby M. E., Aged Twenty-One Months*

Date and Diet	Weight, Kg.	Total Intake, Gm.	Excretion			Retention	
			Urine, Gm.	Feces, Gm.	Total, Gm.	Total, Gm.	Per Kg., Gm.
Nitrogen							
7/14/31 Soy bean diet III*	11.07	8.80	3.83	1.75	5.58	3.22	0.290
7/21/31 Soy bean diet III..	11.32	8.80	4.25	2.24	6.49	2.31	0.204
Calcium							
Soy bean diet III		3.06	0.024	2.070	2.094	0.966	0.087
Soy bean diet III		3.06	0.018	2.750	2.768	0.292	0.025
Phosphorus							
Soy bean diet III		2.77	0.565	1.420	1.985	0.785	0.071
Soy bean diet III		2.77	0.518	1.852	2.370	0.400	0.031

* Percentage composition of soy bean food III (as submitted by the manufacturer): soy bean flour, 67.5; barley flour, 9.5; olive oil, 18.96; sodium chloride, 1.35; dicalcium phosphate, 4.5. Diet: soy bean food III, 176 Gm.; cane sugar, 30 Gm.; 5 per cent ferric citrate, 2 cc.; water, 1,050 cc.; orange juice, 120 cc.; peaches, 100 Gm.; apricots, 200 Gm.; tomatoes, 100 Gm.; string beans, 100 Gm.; arrowroot crackers, 5.

retention of phosphorus equal to one seventeenth of the nitrogen retention plus one half of the calcium retention may be considered as necessary to provide for the normal development of tissues. In table 3 are summarized the retention data, the relative intake and retention ratios and a comparison of the observed phosphorus retentions with the retentions of this element calculated as necessary from the nitrogen and calcium retentions.

The phosphorus retentions observed when soy bean diets I and II were given fell far below the amounts calculated as necessary. When milk or soy bean diet rich in phosphorus (diet III) was fed, the retentions of phosphorus were ample. The excess phosphorus retentions noted during the last two periods may have been caused by the previous depletion of the infant in this element. A similar excess retention of phosphorus was also observed with the second infant (M. E., tables 2

12. Stearns, G.: The Significance of the Retention Ratio of Calcium: Phosphorus in Infants and in Children, Am. J. Dis. Child. **42**:749 (Oct.) 1931.

and 3). The diet of this child previous to his entrance to the hospital was not known. The retentions of nitrogen, calcium and phosphorus were all very large during the first period of study, a fact which is often indicative of a previous partial starvation. By the second period, a week later, the amounts retained were more nearly the predicted quantities.

A study of the comparative intake and retention ratios of nitrogen, calcium and phosphorus with the different diets is of interest. When infant D. H. was given the milk diet, the ratio of the nitrogen and phosphorus retentions approximated the ratio of the intake of these elements; the retention ratio of calcium: phosphorus was higher than the intake ratio. With soy bean diets I and II, the intakes of nitrogen and calcium were greatly increased relative to the intake of phosphorus. The retention ratios of both nitrogen and calcium to phosphorus were lower than the intake ratios; the retention ratios tended to approach the ratio observed with the milk diet. The ratio of nitrogen: phosphorus in soy bean diet III was approximately half that of milk. When this diet was given, the retention ratio of these elements was greater than the ratio in the diet, and again approached the ratio of milk. The retention ratios of the child M. E., given diet III, showed more variation, but the nitrogen: phosphorus retention ratio tended to approach the ratio of milk. The calcium: phosphorus retention ratios were not so satisfactory.

Tso, Yee and Chen [1b] fed infants soy bean preparations containing little or no added calcium salts. The data obtained by these investigators, together with the ratios of intake and retention, are given in table 4. The intake ratios of nitrogen, calcium and phosphorus for infants on the soy bean diet are again quite different from those of infants on a milk diet. In none of the experimental periods was the observed retention of phosphorus sufficient for the retentions of nitrogen and calcium, notwithstanding the fact that the observed calcium retentions were far below the values noted in infants D. H. and M. E. (tables 1 and 2).

Several investigators [13] have studied the effect of altering the dietary ratios of calcium and phosphorus on the retentions of these elements. Unfortunately, in many of the experiments, calcium chloride was chosen to provide the excess calcium of the diet, thus altering the

13. Orr, W. J.; Holt, L. E., Jr.; Wilkins, L., and Boone, F. H.: The Relation of Calcium and Phosphorus in the Diet to the Absorption of These Elements from the Intestine, Am. J. Dis. Child. **28**:574 (Nov.) 1924. Telfer, S. V.: Studies on Calcium and Phosphorus Metabolism: I. The Excretion of Calcium and Phosphorus, Quart. J. Med. **16**:45, 1922. Blühdorn, K.: Untersuchungen des Kalk- und Phosphorsäurestoffwechsels bei Verabfolgung grossen Gaben von Kalk und Natriumphosphat, Ztschr. f. Kinderh. **29**:43, 1921.

TABLE 3.—*Comparison of Observed and Calculated Retentions of Phosphorus, Together with Relative Ratio of Nitrogen, Calcium and Phosphorus in Intakes and Retentions*

Diet	Observed Retentions			Calculated Phosphorus Retentions			Difference Between Observed and Calculated Phosphorus	Intake Ratio			Retention Ratio		
	Nitrogen, Gm. per Kg.	Calcium, Gm. per Kg.	Phosphorus, Gm. per Kg.	N/17*	Ca/2†	Total		Nitrogen	Calcium	Phosphorus	Nitrogen	Calcium	Phosphorus
Baby D. H.													
Milk	0.156	0.037	0.027	0.009	0.018	0.027	±0.000	6.4	1.2	1	5.8	1.4	1
Soy bean diet I	0.134	0.038	0.017	0.008	0.019	0.027	−0.010	10.3	2.8	1	8	2	1
Soy bean diet II	0.134	0.039	0.009	0.008	0.019	0.027	−0.018	21.5	5.2	1	15	4	1
Soy bean diet II	0.180	0.072	0.019	0.011	0.036	0.047	−0.028	21.2	5.0	1	9	4	1
Soy bean diet III	0.106	0.031	0.028	0.006	0.015	0.021	+0.007	3.0	1.0	1	5.5	1.1	1
Soy bean diet III	0.194	0.043	0.036	0.010	0.021	0.031	+0.005	3.1	1.0	1	5.4	1.2	1
Baby M. E.													
Soy bean diet III	0.290	0.087	0.071	0.017	0.043	0.060	+0.011	3.2	1.1	1	4.1	1.2	1
Soy bean diet III	0.204	0.025	0.031	0.012	0.012	0.024	+0.007	3.2	1.1	1	6.6	0.8	1

* N/17, one seventeenth of the nitrogen retention.
† Ca/2, one half of the calcium retention.

TABLE 4.—*Observed and Calculated Retentions of Phosphorus, Together with the Relative Ratio of Nitrogen, Calcium and Phosphorus of the Infants Given Soy Bean "Milk"* *

	Age, Months	Weight, Kg.	Observed Retentions			Calculated Phosphorus Retention, Total	Difference Between Observed and Calculated Phosphorus	Intake Ratio			Retention Ratio		
			Nitrogen, Gm. per Kg.	Calcium, Gm. per Kg.	Phosphorus, Gm. per Kg.			Nitrogen	Calcium	Phosphorus	Nitrogen	Calcium	Phosphorus
B. Y.	3½	5.32	0.240	0.007	0.008	0.017	−0.009	12.3	0.3	1	30	0.9	1
		5.46	0.234	0.008	0.007	0.018	−0.011	12.3	0.3	1	33	1.1	1
	4	5.85	0.179	0.007	0.005	0.013	−0.008	12.5	0.3	1	36	1.4	1
		5.98	0.202	0.009	0.007	0.016	−0.009	12.5	0.3	1	29	1.3	1
B. C.†	6	7.32	0.229	0.019	0.019	0.023	−0.004	11.9	0.46	1	12	1	1
	6½	7.56	0.213	0.017	0.014	0.021	−0.007	11.7	0.46	1	15	1.2	1

* The data in this table are from the study of Tso, Yee and Chen (Chinese J. Physiol. 2:409, 1928).
† Calcium lactate, equivalent to 78 mg. of calcium, was added to the daily diet of this infant.

acidity of the intake and introducing a second factor. In other experiments, the retentions observed with the control diets were so far from satisfactory that comparisons are difficult. It seems reasonable to suppose, however, that a marked increase in the intake ratio of nitrogen: phosphorus will decrease the amount of absorbed phosphorus available for the formation of calcium phosphate, and thus intensify the effect of an already high calcium: phosphorus intake ratio. It is also evident, as is illustrated by the experiments of Tso and Yee, that the intake of each element must be quantitatively sufficient.

In the feeding of infants, therefore, it must be considered necessary not only to provide sufficient quantity of each element for proper nutrition, but also to provide these food elements in the proper proportion to each other. For example, an intake of phosphorus that is sufficient when human milk is fed is insufficient for a diet containing a larger proportion of nitrogen or calcium. From the data obtained, the ratio of nitrogen, calcium and phosphorus in cow's milk would seem to be a safe proportion to use. A relative proportion of nitrogen and calcium to phosphorus lower than the ratio in milk would appear to be safer than any marked increase in these quantities. The two infants given soy bean diet III exhibited reasonably satisfactory retentions of these elements. This type of feeding would appear to be clinically safe.

Urinary Excretion of Calcium.—Alterations in the relative intakes of nitrogen, calcium and phosphorus affected not only the retentions of calcium and phosphorus, but also the mode of excretion of these elements. When soy bean diet I was given baby D. H. (table 1), the excretion of phosphorus in the urine was markedly decreased, and the urinary calcium increased even more markedly. Soy bean diet II contained still less phosphorus, and when fed resulted in even greater changes in the urinary calcium and phosphorus. The low urinary phosphorus excretion cannot in itself be considered abnormal, but follows from the low intake. The excretion of phosphorus in the urine of breast-fed infants is likewise very small. The urinary calcium findings, however, are considered definitely abnormal.

Increased urinary excretion of calcium is observed in normal persons after the ingestion of diets very acid in ash. Calcium carbonate was added to soy bean food I to provide a source of calcium.[2] It also serves to neutralize the acidity of the diet. In soy bean food II the soy bean flour used had been subjected to further refinement, which decreased the phosphorus content. The acidity of the diet was consequently decreased, yet the excretion of calcium in the urine was more than double that of the first period of the soy bean diet. Soy bean food III contained the same soy bean flour as food I. Dicalcium phosphate was substituted for calcium carbonate. The former salt is

not more alkaline in the body than the latter. The urinary calcium during the periods when soy bean food II was fed dropped to the level observed during the milk feeding.

Dadlez [14] and Rachmilewitz and Stransky [15] found that when calcium salts were introduced intravenously, approximately one third of the injected calcium was excreted in the urine. The exceedingly large urinary calcium values observed in baby D. H. during the feeding of soy bean diets I and II can be explained as caused by a similar overwhelming of the organism with calcium. Either the total quantity of calcium absorbed was much greater than the amount which could be deposited in bone because of the limited phosphorus absorption, or the rate of absorption of calcium far exceeded the rate of deposition. When soy bean diet III was given, the phosphorus retentions were ample to provide for the binding of the absorbed calcium.

TABLE 5.—*Urinary Excretion of Acid and Base by Baby D. H.**

Date	Volume, Cc.	p_H	Titratable Acidity, Cc. N/10	Ammonia, Cc. N/10	Calcium, Cc. N/10	Total Fixed Base, Cc. N/10	Phosphate, Cc. N/10	Sulphate, Cc. N/10	Chloride, Cc. N/10
Soy Bean Diet II									
6/ 8/31	600	8.0	....	110	143	235	0	113	139
Soy Bean Diet III									
7/28/31	500	6.6	34.9	90	9	617	297	111	261
8/ 3/31	500	6.6	57.0	167	9	705	485	117	211

* Expressed as cubic centimeters of tenth-normal solution.

Excretion of Acid and Base in Urine; Retention of Fixed Base.—Because of the differences in urinary excretion of calcium and phosphorus by baby D. H. when soy bean diet II was given, the urinary excretion of other acidic and basic ions was determined during the last three periods studied. The results are given in table 5. The urine was more acid when the intake of phosphorus was increased (diet III). The intake of sodium chloride was greater when diet III was fed, which undoubtedly accounts for the increased chloride excretion during these periods. The sulphate excretion remained constant. Alterations in the quantity of urinary phosphate apparently did not affect the excretion of other anions in the urine.

The most marked urinary changes observed were in the excretion of calcium, phosphorus and fixed base. The higher urinary excretion of calcium was accompanied by a low excretion of other fixed base in the urine; the urinary excretion of fixed base was increased when the

14. Dadlez, J.: Ueber die Ausscheidung von intravenöseingeführtem Calcium, Biochem. Ztschr. **171**:146, 1926.

15. Rachmilewitz, M., and Stransky, E.: Ueber die Beeinflussung der Kalkausscheidung durch Diuretika, Arch. f. exper. Path. u. Pharmakol. **158**:129, 1930.

calcium excretion was low. The data concerning the excretion and retention of fixed base are summarized in table 6. The intake was larger with diet III than with diet II, but the relative distribution of base excretion between urine and feces can be noted. When diet II was given, the urinary calcium was large, nearly one third the total excretion. The excretion of base other than calcium (including sodium, potassium and magnesium) was similarly distributed, approximately one third in the urine and two thirds in the feces. When diet III was fed, the paths of excretion changed. Very little calcium was excreted by the kidney. The excretion of other bases was altered in the opposite direction, 80 per cent or more of the total being excreted in the urine. The retention of fixed base, not calcium, remained constant during the three periods. The relative distribution of these individual bases was

TABLE 6.—*Excretion and Retention of Fixed Base and Calcium by Baby D. H.**

		Total Intake, Cc. N/10	Excretion			Retention, Total, Cc. N/10
			Urine, Cc. N/10	Feces, Cc. N/10	Total, Cc. N/10	
6/8/31	Soy Bean Diet II †					
	Total fixed base.....	1,635	235	575	810	825
	Calcium.....	852	143	351	494	358
	Fixed base, not calcium	783	92	224	316	467
7/25/31	Soy Bean Diet III †					
	Total fixed base.....	2,138	617	902	1,519	619
	Calcium.....	959	9	810	819	140
	Fixed base, not calcium	1,179	608	92	700	479
8/3/31	Soy Bean Diet III					
	Total fixed base.....	2,272	705	913	1,618	654
	Calcium.....	1,052	9	848	857	195
	Fixed base, not calcium	1,220	696	65	861	459

* Expressed as cubic centimeters of tenth-normal solution.
† Composition of soy bean diets II and III as given in table 1.

not determined. It would appear that marked alterations in the relative intake of nitrogen, calcium and phosphorus may alter the manner of excretion, but do not affect to any appreciable degree the total retention of bases other than calcium.

SUMMARY AND CONCLUSIONS

1. The excretion and retention of nitrogen, calcium and phosphorus of an infant fed milk and various soy bean preparations have been determined. The relative proportions of nitrogen, calcium and phosphorus ingested differed with the diets.

2. An increase in the relative intake of nitrogen and calcium, as compared to the phosphorus intake, resulted in an insufficient retention of phosphorus. Under these conditions the urinary excretion of calcium was tremendously increased, and the urinary phosphorus markedly decreased.

3. The excessive excretion of calcium in urine noted with two of the diets is interpreted as evidence of an absorption of calcium greatly in excess of the amount which can be deposited in bone with the limited quantity of phosphorus available.

4. The marked alterations in urinary excretion of phosphate are without apparent effect on the excretion of sulphate and chloride in urine.

5. Excessive excretion of calcium in the urine is accompanied by a shift in the mode of excretion of other bases, decreasing the excretion in urine and increasing the fecal excretion.

6. The altered calcium metabolism does not seem to affect the retention of fixed bases other than calcium.

7. The substitution of dicalcium phosphate for calcium carbonate in the soy bean food improved the relative retentions of nitrogen, calcium and phosphorus. The modified soy bean food, from our observations, appears to be a satisfactory food for infants.

8. It is concluded that in the feeding of infants, the relative proportions of nitrogen, calcium and phosphorus in the diet are fully as important as the absolute intakes of these elements. From the results of this study, it is suggested that, as the relative proportions of these elements in cow's milk allow adequate retention of each, this ratio seems a safe guide to follow.

THE TUBERCULIN PATCH TEST

A DIAGNOSTIC AID IN TUBERCULOSIS

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SIGNIFICANCE OF THE PIRQUET TEST

When Pirquet,[1] in April, 1907, announced his tuberculin test, it marked an epochal advance in phthisiology. Basing his memorable researches on the underlying principle that there was an immediate reaction in serum sickness and vaccination, Pirquet not only offered a simple and reliable method for determining the presence or absence of tuberculous infections, but also valuable data on the prevalence of tuberculosis in children as well as in adults. This also opened an avenue of approach to experimental cutaneous reactions in other diseases, notably in diphtheria (Schick test) and scarlet fever (Dick test).

MODIFICATIONS OF THE PIRQUET METHOD

So universally recognized was the value of the tuberculin test in clinical as well as in experimental medicine that it has given stimulus to numerous modifications aiming at greater precision and simplicity, and to mention those of Craig, Hamburger, Kahara, Lautier, Mantoux-Mendel, Moro, Petruschky, Trambusta and Scarzella would be giving the names of but a few.

When these modifications are grouped, however, they fall into four classes:

1. The percutaneous (Moro ointment).
2. The cutaneous (Petruschky).
3. The intracutaneous (Mantoux).
4. The subcutaneous (the *Stich* reaction of Epstein, Escherich, Schick and Hamburger).

For practical purposes these modifications can be divided into two cardinal classes:

1. The contact method, nontraumatic.
2. The traumatic method, which, classified according to the degree of trauma, would be cutaneous, intracutaneous and subcutaneous modifications.

From the Children's Clinic, Mount Sinai Hospital, and the Children's Department of Sea View Hospital, Staten Island, service of Dr. Béla Schick.

1. von Pirquet, C.: Tuberculin Diagnose durch kutane Impfung, Berl. klin. Wchnschr. **20**:22, 1907.

PRECISION OF THE MANTOUX TEST

From present indications it would seem that because of its greater precision the Mantoux modification survived the test of time and is therefore frequently employed.

That the Mantoux test is more sensitive than the original Pirquet test has been well established. Bass,[2] for example, in comparing the results of the cutaneous and intracutaneous reactions in 206 children, found that if 3 cutaneous tests were made, only 10.1 per cent of the children gave positive reactions, while with 3 cutaneous and 1 intracutaneous tests (0.1 mg), the number of children with positive reactions increased to 16.5 per cent. Retesting with 3 intracutaneous tests (1 mg.), raised the percentage of positive reactions to 25.2 per cent. Like claims are made by Wallgren,[3] who found that a Mantoux test of 0.1 mg. gave 20 per cent more positive reactions than a single Pirquet test. Similarly, Hart,[4] in his series of 1,030 clinically tuberculous patients, found that a negative intracutaneous reaction with 0.1 cc. of a 1 : 10,000 dilution (0.01 mg.) did not exclude tuberculosis unless subsequent tests with 0.1 cc. of a 1 : 10 dilution (10 mg.) were also negative, and that while there was an error of 12 per cent when 0.1 cc. of a 1 : 10,000 dilution (0.01 mg.) was used, this error was only from 2 to 3 per cent when 0.1 cc. of a 1 : 10 dilution (10 mg.) was employed.

The greater precision of the intracutaneous test (Mantoux) lies in the possibility of varying the amount of tuberculin that is employed. The amount of tuberculin which is absorbed from the skin where it is applied corresponds to about $\frac{1}{100}$ mg. of this substance. If concentrated old tuberculin is applied in the manner of the Pirquet test on one arm and injected intracutaneously in a corresponding area of the other arm 0.1 cc. of a dilution of 1 : 10,000 (0.01 mg.) of old tuberculin, both tests, the cutaneous and the intracutaneous, will be either positive or negative. But with the Pirquet test, after one has obtained a negative reaction with old tuberculin, an increased amount of tuberculin cannot be used, nor can the concentration be increased. On the other hand, with the intracutaneous tests one is able to increase the concentration of the tuberculin solution from 1 : 10,000 to 1 : 1,000, 1 : 100 and 1 : 10, etc., and thus thereby apply more and more tuberculin. Also, if the sensitiveness to tuberculin is relatively low, the Pirquet test may be negative, while the Mantoux test, with a dilution of 1 : 2,000, 1 : 1,000, 1 : 100, etc., may be positive.

2. Bass, Murray H.: Cutaneous and Intracutaneous Tuberculin Tests in Infants and Children, Am. J. Dis. Child. **15**:313 (May) 1918.

3. Wallgren, A.: Reliability of Pirquet Test, Norsk mag. f. laegevidensk. **91**: 1043 (Oct.) 1930.

4. Hart, D. P.: The Value of Tuberculin Tests in Man, Medical Research Council Special Report Series, London, His Majesty's Stationery Office, 1932. Editorial: Value of Tuberculin Tests, J. A. M. A. **98**:1486 (April 23) 1932.

DISADVANTAGES OF THE MANTOUX TEST

The Mantoux test, however, in spite of its greater precision, cannot be the method of choice for practical purposes. It is painful and therefore hard to carry out on a resisting child; it is time-consuming; it requires the sterilization of needles, syringes and other instruments, and offers technical difficulties to those who are not accustomed to its routine. Furthermore, increasing doses may oversensitize the patient, producing necrosis, vesiculation, ulceration and a rise of temperature, as recently shown by Gleich,[5] in whose series of 200 Mantoux tests with 0.1 cc. of 1:1,000 solution (0.1 mg.) of old tuberculin, 11 children manifested these unfavorable reactions. That the Mantoux test with higher concentration is not without danger has been proved by Comby,[6] who reported a fatal case resulting from faulty technic in performing the Mantoux test.

METHOD DESIRABLE FOR ROUTINE WORK

The intracutaneous test should therefore be used only when definite proof is required as to whether or not a subject is free from tuberculosis after some simpler method has produced a negative reaction. In hospital work the Mantoux test may be desirable first as well as last. For routine work, in the great majority of cases or in practice, a more desirable test is one which is:

1. Reliable
2. Painless (especially important when dealing with a nervous or resisting child)
3. Of simple technic
4. Least time-consuming (of significance when large numbers are to be tested or in busy practice)
5. Free from danger of infection
6. Easy to interpret, the area of reaction being clearly visible
7. Within the possibility of controlling the extent and severity of the reaction

THE TUBERCULIN PATCH TEST

With such aims in view a method has been devised, based on the researches of Lautier,[7] Blumenau,[8] Kahara,[9] Schmidt-Weigerer,[10] Hebetin,[11] Malmerg and Fromm.[12] It will be referred to as the tuberculin

5. Gleich, Morris: Comparative Value of von Pirquet and Mantoux Tests in Colored Infants and Children, Arch. Pediat. **49**:399 (June) 1932.

6. Référat de Société de Pédiatrie, Foreign Letter, Paris, J. A. M. A. **95**:352 (Aug. 2) 1930.

7. Lautier: Compt. rend. Soc. de biol. **64**:5 and 91 (Jan. 7) 1908.

8. Blumenau: Ztschr. f. Tuberk. **22**:157, 1914.

9. Kahara, Z.: Ztschr. f. Kinderh. **2**:747, 1912.

10. Schmidt-Weigerer: Med. Klin. **9**:375, 1913

11. Hebetin: Wien. klin. Wchnschr. **41**:703, 1928.

12. Malmerg, N., and Fromm, B.: New Tuberculin Test, Acta paediat. **10**: 435, 1931.

patch test. So far as my knowledge goes, the test has not been introduced in this country up to the present writing. It was performed on 176 children at the Pediatric Clinics of the Mount Sinai and Sea View Hospitals.

METHOD OF PROCEDURE

1. The skin of the flexor surface of the forearm or the sternum was cleaned with ether.

2. One or 2 drops of original, old tuberculin (Koch) was placed on a piece of adhesive plaster (about 3 by 3 cm.) and applied to the previously cleaned skin. No boring, scratching, puncturing or rubbing of the skin is required.

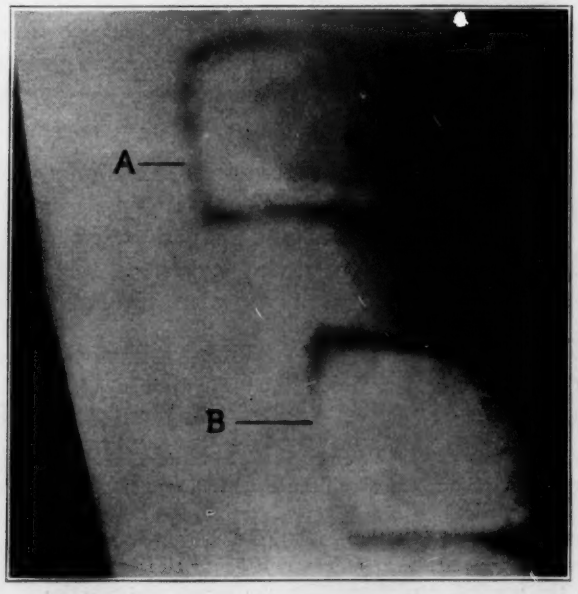

Fig. 1.—Tuberculin patch test. *A*, positive reaction; *B*, control.

3. As a control, a drop of water was placed on a piece of adhesive which was applied to the skin below.

4. A third piece of adhesive previously treated with 1 or 2 drops of tuberculin, as before, was applied to the skin below the control.

5. After forty-eight hours, the three pieces of adhesive plaster were removed and the results compared. A positive reaction was indicated by the presence of an area of redness studded with small, confluent papules and vesicles, both visible and palpable, and usually limited to the area of the skin which was covered by the adhesive plaster, while the control was free from redness.

In a test as simple as this there is much room for variations. For example, the drop of tuberculin can be placed on the skin and then covered with adhesive plaster, instead of being applied to the adhesive first, as was done in this series; there is, however, less opportunity for a restless child to rub off the tuberculin if it is

applied to the adhesive plaster first. Also, the location chosen is of no significance. The test can be made on the sternum or on any part of the soft skin just as well as on the flexor surface of the forearm. While at first a drop of water was placed on the adhesive plaster as a control, this was later found to be unnecessary. It is, however, essential that in applying the adhesive plaster its edges should be pressed so that the drop of tuberculin will not flow out. To prevent a restless

Fig. 2.—Tuberculin patch test. *A*, positive reaction; *B*, control, and *C*, positive reaction. *A* and *C* showed papules and vesicles on a red surface, limited to the area covered by the adhesive plaster. *B* was also red in 10 cases of this series, but had no papules or vesicles. The redness disappeared twenty-four hours after the adhesive plaster was removed, as shown in figure 3.

Fig. 3.—Same as figure 2 after the adhesive plaster had been removed and marks cleaned off with benzene. *A*, positive reaction; *B*, former area of control after the redness had disappeared, and *C*, positive reaction.

child from removing the plaster, it may be necessary to place a larger piece of this material over the first piece, or to cover it with a bandage.

A double, concentrated Koch's old tuberculin was used, with one part of a 50 per cent solution of phenol in glycerine and two parts physiologic sodium chloride, supplied by the board of health, which is ordinarily employed for routine Pirquet tests in the Children's Clinic. No special type of adhesive plaster is

required. The object of the latter is to promote contact of the tuberculin with the skin, to compress the underlying tissues and to bring about hyperemia.

In 10 cases of this series in which the reaction was positive the control also showed some redness, but it could be differentiated from the other areas of redness by the absence of papules and vesicles. Besides, redness in the area of control disappeared after the adhesive plaster had been off for about twenty-four hours, while the skin which was in contact with the tuberculin maintained its reactions for a number of days.

For comparison, the Pirquet test was used, either by selecting children whose history of a positive or negative tuberculin test was known, or by making the tests simultaneously, i. e., a tuberculin patch test on one arm and a Pirquet test on the other.

The results are indicated in the table.

As seen from this table, of 152 children with positive Pirquet tests 146, or 96 per cent, showed a positive tuberculin patch test also and 6 a questionably positive test. Twenty-three children with a negative Pirquet test also had a negative patch test. In a case in which the Pirquet test was questionably positive the patch test was negative. The findings in this series are in perfect accord with those obtained by Hebetin[11] (96.25 per cent) and more recently by Malmerg and Fromm.[12]

Results of the Pirquet and Tuberculin Tests

Cases	Pirquet Test	Tuberculin Patch Test
146	Positive	Positive
23	Negative	Negative
6	Positive	Questionably positive
1	Questionably positive	Questionably negative
Total 176		

NATURE AND SPECIFICITY OF THE REACTION

The fact that mere contact of tuberculin with the skin produces a specific reaction serves to emphasize the view that the skin itself is endowed with a biochemical defense mechanism against tuberculosis, or, according to the teachings of Pirquet, the tuberculous infection causes the formation of antibodies (ergin) which act on the foreign substance to produce toxic products (apotoxins). Expressed in formula: ergin + tuberculin = apotoxin. The cutaneous reaction seen in the positive tuberculin test, then, represents the formation of apotoxins within the skin.

That this apotoxin is specific in nature is well borne out by the fact that no other substance except tuberculin will persistently bring about this cutaneous reaction. Bass,[2] for example, had solutions of broth, peptone and glycerin prepared in the same way as tuberculin, but omitted the addition of tubercle bacilli. These were injected intracutaneously after the manner of the Mantoux test. No reaction was obtained regardless of whether there were positive or negative reactions to the various tuberculin tests, nor could he find any relation between the erythema caused by the application of mustard, cantharides, phenol and other irritants to the skin, and that of the Pirquet reaction.

Moreover, the formation of apotoxins within the skin, while so peculiar to tuberculosis, apparently does not occur in all infectious diseases, such as diphtheria and scarlet fever. Experimental diagnostic reactions have thus far not been obtained in these diseases when percutaneous or cutaneous tests were made with toxins in the manner of the Pirquet or patch tests. Zamkin [13] recently studied a series of 24 children with positive reactions to the Schick test, on whom he tried cutaneous methods and the patch test with dilutions varying from 100 to 350 minimum lethal dose. In no case was there the slightest reaction.

SUMMARY AND CONCLUSION

1. The tuberculin patch test is made by moistening a piece of adhesive plaster with 1 or 2 drops of tuberculin and applying it to the skin, which has previously been cleaned with ether. For control, a piece of adhesive plaster without tuberculin may be used. A positive reaction is indicated by redness studded with papules and vesicles.

2. A study of 176 cases showed that this method compared favorably with the Pirquet test as to reliability.

3. Its advantages over the Pirquet test and other tuberculin tests are:

(*a*) It is absolutely painless and therefore does not spoil the relation between child and physician, or frighten a neurotic patient or anxious mother.

(*b*) It requires no boring, puncturing, scratching or rubbing.

(*c*) It requires no sterilization of instruments, such as lancets, needles and syringes.

(*d*) There is no danger of infection.

(*e*) It is of much simpler technic, so that it can be done by nurses without much training.

(*f*) It is less time-consuming, since there is no waiting for the tuberculin to dry or to act on the skin, or watching that the child does not wipe it off or spread it to the area of control. It is therefore of advantage when large numbers are to be tested or in busy practice.

(*g*) It is possible to control the area of reaction, since this is usually limited to the surface covered by the adhesive plaster. In other percutaneous tests, such as the Moro, the reaction cannot be controlled, once it has started, because the tuberculin must be rubbed into the skin, and friction of clothes tends to spread it still further. In the tuberculin patch test the reaction can be regulated by the size of the adhesive plaster, by the number of drops of tuberculin and by the strength of the dilution.

(*h*) It is easier to interpret the results with the tuberculin patch test, because the area of reaction can be arbitrarily enlarged by applying larger pieces of adhesive plaster, more tuberculin and tuberculin of greater concentration.

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13. Zamkin, Harry O.: Personal communication.

NITRATE NITROGEN IN THE URINE OF CHILDREN

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The urine of persons who are on a general diet invariably contains nitrates. Mitchell, Shonle and Grindley [1] stated that the average concentration of nitrates calculated as potassium nitrate in the urine of normal persons is from 10 to 20 mg. for each 100 cc., and that occasionally it may be as high as 30 or 40 mg. for each 100 cc. Mayerhofer [2] quoted Röhman, and also Weyl and Citron, as stating that 4.25 mg. in each 100 cc. is the usual amount present. Because most foodstuffs, but particularly vegetables, contain nitrates, it was supposed that the nitrates in the urine were derived exclusively from the food. According to Grindley and Mitchell,[3] Röhman was unable to recover nitrate from the urine of dogs fed on meat or from rabbits fed on milk and wheat bread, and his results were confirmed by Weyl and Citron. Experiments in which diets free from nitrate have been used, however, have shown that small amounts of nitrate were still present in the urine. Grindley and Mitchell also stated that Wulffius found that when vegetables were eliminated from the diet and distilled water was used, the amount of nitrous acid became less and less but did not disappear. Weyl and Citron fed men on a diet exclusively of meat, and found that nitrous acid was present in the urine in a concentration equivalent to 35 mg. for each liter. Mitchell, Shonle and Grindley found that when twelve persons were kept on a diet which was almost free from nitrate, they still excreted from 30 to 100 mg. of nitrate calculated as potassium nitrate in the urine daily.

This amount was always more than the amount of nitrate ingested, and in many cases from three to six times that amount. On completing

1. Mitchell, H. H.; Shonle, H. A., and Grindley, H. S.: The Origin of the Nitrates in the Urine, J. Biol. Chem. **24**:461, 1916.

2. Mayerhofer, Ernst: Der Harn des Säuglings, Ergebn. d. inn. Med. u. Kinderh. **12**:553, 1913.

3. Grindley, H. S., and Mitchell, H. H.: Studies in Nutrition. University of Illinois, Laboratory of Physiological Chemistry, Department of Animal Husbandry, Urbana, University of Illinois Press, 1918, vol. 1, pp. 12, 478, 482, 483, 496, 517 and 518.

their extensive study of excretion of nitrate, Grindley and Mitchell stated: "The results of this experiment can only bear one interpretation; i. e., that the nitrates in human urine are not derived entirely from the nitrates in the food, the presumption being that the body is able to form nitrates from unoxidized nitrogenous radicles." They also stated that any theory as to how formation of nitrates is accomplished by the body is purely an assumption. Grindley and Mitchell related that Schönbein long ago put forward the hypothesis that nitrates might be formed in the intestine by the action of nitrifying bacteria in oxidizing ammonia to nitrites and nitrates. Recently Lipman and Greenberg [4] isolated an organism from petroleum taken from a deep well which will oxidize ammonia directly to nitrates. Although such an organism is not likely to be found in the intestinal canal, it is interesting to know that such an organism exists. Another experiment the trend of which is in this general direction is that of Ville and Mestrezat,[5] who found that giving a subject ammonium salts caused an increase in the nitrate content of the saliva.

Some of the work just referred to was done on children. Thus it was known that the urine of infants and children could contain nitrates or nitrites, but quantitative data were not available. We therefore thought that it would be of interest to ascertain the amount of nitrate nitrogen in the urine of well and of sick children. The work was carried out in the laboratory of the Mayo Clinic. The method used for the quantitative determination was that of Whelan.[6] The underlying reaction has been explained by Stromberg.[7] The reaction depends on the formation of diphenylbenzidine violet from diphenylbenzidine. The resulting color is compared with a standard. The reaction is given by nitrates and nitrites, and the results are expressed in milligrams of nitrate nitrogen in a given quantity of urine. The method is sensitive to 0.0003 mg.

The urine of three groups of children was studied. One group consisted of twenty-five infants who were from 2 to 20 days of age and were still in the nursery at the hospital where they were born. The

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4. Lipman, C. B., and Greenberg, L.: A New Autotrophic Bacterium Which Oxidizes Ammonia Directly to Nitrate and Decomposes Petroleum, Science **75**: 192 (Feb. 12) 1932.

5. Ville, J., and Mestrezat, W.: Origine des nitrites contenus dans la saliva; leur formation par réduction microbienne des nitrates éliminés par ce liquide, Compt. rend. Soc. de biol. **63**:231 (July 27) 1907.

6. Whelan, Mary: A Colorimetric Method for the Quantitative Determination of Nitrates and Nitrites in Biologic Fluids, J. Biol. Chem. **86**:189 (March) 1930.

7. Stromberg, Hans: A Study of Diphenylbenzidine as a Test for Nitrates and Nitrites, Proc. Staff Meet., Mayo Clinic **7**:254 (April 27) 1932.

second group consisted of 30 well children who were from 1 to 5 years of age. The third group consisted of thirty-eight children who had various diseases and who were in the hospital.

The twenty-five newly born infants were all well developed and well nourished, and had no gastro-intestinal disturbances. All the mothers were in the hospital, and all were receiving the same diet. The diet of the infants varied as follows: Six infants were fed only breast milk; six were fed only lactic acid milk; two were fed according to a standard formula, which included cow's milk, water and corn syrup and nothing else; three were fed breast milk supplemented by lactic acid milk, and nothing else, and eight were fed breast milk supplemented by the ingredients of the standard formula, and nothing else. The nitrate nitrogen

TABLE 1.—*One or More Determinations of Nitrate Nitrogen in Urine, from Each of Twenty-Five Well, Newly Born Infants Who Were on Different Diets*

Breast Milk		Lactic Acid Milk		Breast Milk and Lactic Acid Milk		Breast Milk and Standard Formula		Standard Formula	
	Mg. for Each		Mg. for Each		Mg. for Each		Mg. for Each		Mg. for Each
Case	100 Cc.	Case	100 Cc.	Case	100 Cc.	Case	100 Cc.	Case	100 Cc.
1	0.00; 0.00	7	0.00	13	0.00; 0.20; 0.20; 0.20	16	0.05	24	0.00
						17	0.37; 0.08	25	0.78
2	0.00	8	0.00	14	0.20	18	0.08		
3	0.00; 0.15	9	0.00	15	0.11; 0.20; 1.31	19	0.17		
4	0.00; 0.00; 0.08	10	0.00			20	0.26; 0.47; 0.50; 0.60		
						21	0.50		
5	0.11	11	0.00			22	1.30		
6	0.23; 0.40	12	0.70			23	0.07; 1.30		

When more than one determination was made in any case, they were made on different days.

found in the urine of these infants varied from 0 to 1.31 mg. in each 100 cc. (table 1). The urine of infants who were fed exclusively on either breast milk or lactic acid milk often did not contain demonstrable amounts of nitrates or nitrites. One infant, however, who received only lactic acid milk had 0.7 mg. of nitrate nitrogen in each 100 cc. of urine, and one infant who received breast milk only had 0.4 mg. of nitrate nitrogen in each 100 cc. of urine. The standard formula was prescribed for only two children, and results were so divergent as to be of no significance. Among the infants who were fed breast milk supplemented by lactic acid milk there was only one whose urine did not contain some nitrate nitrogen, and among those who were fed breast milk supplemented by the standard formula, nitrate nitrogen was found in the urine more frequently and in larger amounts than among the infants who were fed on any of the other diets. Mayerhofer postulated that the urine of normal nurslings never contains nitrates, but it seems that the urine of infants may contain nitrate even though they do not give any evidence of gastro-intestinal, or of any other, disturbance.

Children, None More Than 15 Years of Age, Who Were Sick in the Hospital

Case	Approximate Age	Mg. for Each 100 Cc.	Case	Approximate Age	Mg. for Each 100 Cc.
26	Preschool	0.00	41	Preschool	0.75
27	Kindergarten	0.05	42	Preschool	0.82
28	Preschool	0.23	43	Preschool	0.85
29	Infant	0.28	44	Preschool	0.99
30	Preschool	0.31	45	Preschool	1.03
31	Preschool	0.33	46	Preschool	1.20
32	Preschool	0.37	47	Preschool	1.27
33	Preschool	0.37	48	Preschool	1.34
34	Preschool	0.44	49	Preschool	1.35
35	Preschool	0.48	50	Preschool	1.51
36	Preschool	0.50	51	Preschool	1.54
37	Kindergarten	0.54	52	Kindergarten	1.60
38	Preschool	0.56	53	Preschool	1.89
39	Preschool	0.70	54	Preschool	2.00
40	Preschool	0.71	55	Preschool	2.31

TABLE 3.—*Determinations of Nitrate Nitrogen in the Urine of Thirty-Eight Children, None More Than 15 Years of Age, Who Were Sick in the Hospital*

Case	Diagnosis	Mg. for Each 100 Cc.	Mg. for Each 24 Hrs.	Case	Diagnosis	Mg. for Each 100 Cc.	Mg. for Each 24 Hrs.
56	Nephritis	0.00		75	See table 4		
57	Nephritis	0.8		76	Gastro-intestinal disturbance	3.29	
58	Nephrosis	3.1*		77	Duodenal ulcer	7.58	60.6‡
		2.7		78	Chronic ulcerative colitis	1.8	4.23
59	Renal stone	0.105				4.0	10.00
60	Splenic anemia; intestinal obstruction; renal stones	1.0				3.77	11.3
						1.2	6.9
61	Scrotal swelling	0.00				2.6	4.42
62	See table 4			79	Inguinal hernia	2.8	7.0
63	Diabetes insipidus	0.08	8.8†	80	Appendicitis	0.59	
		0.83	9.55	81	Appendicitis	0.27	
		0.56	20.90			1.08	
64	Cyst of thyroglossal duct	2.6	9.1	82	Peritonitis	0.28	
65	Congenital megacolon.	0.104	0.37			0.20	
		0.17	1.10	83	Harelip	0.4	
		0.07	0.25			0.5	
66	Congenital megacolon.	0.00		84	Agranulocytic angina	0.60	
		1.00		85	Malignant tumor	2.1	
67	Congenital megacolon.	0.27				0.8	
		1.20		86	Fractured elbow	2.0	
68	Congenital megacolon.	0.00		87	Congenital dislocation of hip	0.8	
		1.47	5.88			1.3	
69	Congenital megacolon.	0.6		88	Tuberculosis of knee	1.0	
		0.9		89	Behavior disturbance	0.16	
70	Chronic ulcerative colitis	1.0		90	Epilepsy	0.7	
		2.0		91	Epilepsy	2.54	
		1.4				2.08	
71	Celiac disease	2.81	21.00			1.16	
		2.25	6.57			0.50	
		0.00		92	Encephalitis	2.7	
		1.01				0.0	
72	Celiac disease	0.53	5.83	93	Questionable	0.09	0.99
		3.62	19.90			0.56	5.04
73	Celiac disease	2.6				0.13	1.22
		1.4				0.47	3.86
		2.6				0.105	1.05
74	Celiac disease	3.7					
		7.4					
		7.0					
		7.7					
		3.5					

* When more than one determination was made in any case, they were made on different days.

† Determinations which appear in the same horizontal line were made on the same day.

‡ In 800 cc. according to the record; probably the 800 cc. was collected in twenty-four hours.

The thirty children aged from 1 to 5 years in the second group were all on a general diet, receiving three meals a day. The concentration of nitrate nitrogen in the urine varied from 0 to 2.31 mg. in each 100 cc. (table 2). Since none of these children was suffering from any gastro-intestinal disturbance, and since they were all well in other respects, this amount may be considered as the average for children of this age. The amounts seem to be about the same as those found by Grindley and Mitchell in the urine of adults.

The third group, that comprising thirty-eight children who were sick and in the hospital, were suffering from a variety of disorders, as indicated in tables 3 and 4. The diet was general unless a specific diet was indicated in the treatment of the particular illness which the child had. The nitrate nitrogen in this group varied from 0 to 33.0 mg. in

TABLE 4.—*Determinations of Nitrate Nitrogen in Fluids of Two of the Thirty-Eight Children (Table 3) Who Were Sick in the Hospital*

		Mg. in Each 100 Cc.			
Case	Diagnosis	Urine	Saliva	Tears	Blood Plasma
62	Adenoma of parathyroid gland	0.00	0.00		
		0.20			
75	Celiac disease.....	11.8			
		13.8			
		33.0			
		13.0			
		14.3	12.4*		
		11.0	16.0		
		8.3	7.0		0.28
		19.0	8.0	0.04	

* Determinations which appear in the same horizontal line were made on the same day.

each 100 cc. of urine. About 3 mg. of nitrate nitrogen was considered as the upper limit of normal, and particular consideration will be given to only the seven children whose urine contained more than 3 mg. of nitrate nitrogen in each 100 cc. (cases 58, 72, 74, 75, 76, 77 and 78). Of these seven children, six had some disorder of the gastro-intestinal tract. Three of these six had celiac disease, and one of the three was the patient (case 75) whose urine contained the highest proportion of nitrate nitrogen in the group.

Case 75 was studied in detail (table 4). It had been known for some time that determinations of urea in the saliva parallel determinations of urea in the urine. With this case in view, it was therefore suggested to Whelan that determination of nitrate be tried on the saliva of normal persons. She found that the concentration of nitrates in the saliva of normal persons also parallels that of nitrates in the urine. Determinations for nitrate nitrogen were later made on the saliva in cases 62 and 75. In case 62, no nitrate nitrogen was found in the saliva, but in case 75 the values for nitrate nitrogen in the saliva were high and comparable

to the value for nitrate nitrogen in the urine on the same day. In case 75, a determination was also made on the blood plasma, as well as one on the tears, flow of which was induced by having the patient handle onions (table 4).

Two sources of origin were considered. 1. Schönbein, as has been said, presented the hypothesis that nitrates might be formed in the intestine by the action of nitrifying bacteria. Cultures from the stool in case 75 were therefore made on a medium containing an ammonium salt as a source of nitrogen, but no nitrates were formed. It can be stated, accordingly, that the nitrates excreted in the urine of this patient were probably not formed in the intestine by nitrifying bacteria. 2. Vegetables contain relatively large amounts of nitrates, and the patient in case 75, as part of the treatment for the celiac disease, received vegetable in the form of soy bean muffins. He liked them and ate them in great numbers. An adult used as a control, however, ate six soy bean muffins a day for several days; there was no increase in the percentage or in the total amount, of nitrate nitrogen in the urine.

SUMMARY

It was found that nitrates may be present in the urine of well children even when the diet is exclusively of lactic acid milk or of breast milk. High values were obtained in cases in which there was some disease of the digestive tract, and the highest figures were obtained in a case of celiac disease. The determinations for nitrate nitrogen in the urine in some of the cases of celiac disease, however, fell within the limits of normal.

PARALYSIS OF THE DIAPHRAGM IN THE NEW-BORN

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The phenomenon accompanying injury to the phrenic nerves in adults has been studied from many angles. There are cases of therapeutic phrenic exeresis, and more rare accidental injuries, especially by lacerated and puncture wounds of the neck. The recognition of injury to the phrenic nerve in new-born babies is a comparatively recent advance.

Weigert reviewed thirty cases of diaphragmatic paralysis, of which two were in the new-born. Kofferath, in 1921, made the greatest advance in the knowledge concerning this condition when he described the value of fluoroscopic examination of the chest. Following this came contributions by Friedman and Chamberlain in 1926, Dyson in 1927, F. Schweitzer in 1927, Epstein in 1927, Zeligs in 1928, Mulzer in 1928 and Remé in 1930.

Studying the data presented by these authors, we note respiratory difficulty of various grades of severity in the new-born, owing to injury of the unilateral phrenic nerves, and consequent diaphragmatic paralysis. In all cases the condition was thought to be due to some obstetric manipulation. In all but one case this occurred during a difficult delivery. In Dyson's patient the trauma was caused by an unusual accident, namely, a lacerated wound of the neck made in cutting the cord wrapped about it.

A notable observation in the review is the delay in onset of symptoms in some of the cases. In Friedman and Chamberlain's patient attacks of cyanosis on the thirteenth day were the first evidences of the disturbance. Why the symptoms in some cases appear at birth, while in others they are delayed for hours or even days is obscure (table 1).

Following is a detailed report of our cases.

REPORT OF CASES

CASE 1.—David L. F., a boy, was born on Aug. 27, 1927, of a primipara, by a difficult delivery with forceps. At birth the cry was feeble; examination revealed slight cyanosis, which cleared up in two days, and an extremely molded head with a marked caput succedaneum. There was right brachial paralysis. On September 21, nearly four weeks after birth, the child became cyanotic and had

attacks of rapid, irregular respirations. There were diminished expansion, dulness approaching flatness, with absence of breath sounds, and a few fine, crackling râles on the right side of the chest. The left side was normal. Following stimulation, the respiratory symptoms improved. Roentgenographic examination made on September 26 revealed paralysis of the right side of the diaphragm. Improvement in breathing continued, and the baby was discharged from the hospital with slight dyspnea. He was readmitted on October 20, at the age of 8 weeks, with a history of marked cyanosis and gasping respirations. He had lost weight, and the general condition was extremely poor. After admission there were numerous seizures which were characterized by clonic convulsions and extreme cyanosis. Unfortunately, we have no roentgen records made on this admission. Death occurred on October 22. Autopsy was performed, and Dr. W. U. McClenahan reported congenital heart disease, defective interventricular septum and patent foramen ovale, infarction in the wall of the left ventricle and atelectasis of the right lower and left lower lobes of the lungs.

The first attack of respiratory distress which this infant suffered was in all probability due to diaphragmatic paralysis. In the second attack this diagnosis was definitely made on basis of the roentgenograms, but during the first and third attacks, unfortunately no studies of this kind were made. There is a possibility that the diaphragmatic paralysis had not developed at birth, and that the respiratory symptoms in evidence during the first few days were due to some other cause, especially cerebral hemorrhage, but the diaphragmatic paralysis was probably coincident with the brachial paralysis which appeared on the first day of life. In view of the marked changes found in this baby's heart at autopsy, especially the infarction in the left ventricular wall, the third and fatal attack was probably due to cardiac disturbances.

Case 2.—Baby C. was delivered on Dec. 29, 1929, with forceps from an occiput posterior position. During delivery the shoulders were blocked, and traction was necessary. About two hours later cyanosis began, intermittent at first, then continuous, with periods of exacerbation. The patient was first seen in consultation by one of us (R. M. T.) on December 30. At this time cyanosis, jerky respirations and a sharp, fretful cry were the striking symptoms. The infant nursed fairly well and swallowed satisfactorily. There were signs of consolidation in the lower lobe of the right lung. Heart dulness did not seem to be displaced, and there were no murmurs. Complete paralysis of the right arm was present. The rectal temperature was 100.2 F. Lumbar puncture gave a clear fluid. Roentgenograms made at this time showed the diaphragm higher than normal on the right side. Fluoroscopic examination revealed the characteristic see-saw movement of the diaphragm and horizontal to and fro movement of the mediastinal shadow with each respiration. This baby died of respiratory failure twenty-four hours after delivery.

This case presented a typical clinical picture of right-sided diaphragmatic paralysis. It is believed that this, with its consequent atelectasis, was the cause of the patient's death.

Case 3.—Baby F. was easily delivered on Feb. 27, 1930, of a primipara, with the aid of outlet forceps, following a labor lasting ten hours. The cry at birth was lusty and immediate, and the child seemed normal, except for a right brachial paralysis. Twenty-four hours after birth the infant was observed to have cyanosis and rapid respirations. There was an elevation of temperature at this time. One of us (R. M. T.) saw this baby in consultation on February 28. At this time examination revealed an infant with obvious dyspnea, noticeably jerky respirations, mostly thoracic, accompanied by cyanosis. Expansion of the right

TABLE 1.—*Summary of Cases*

Author and Reference	Type of Injury or Delivery	Brachial Palsy on Same Side	Time of Onset of Symptoms and Clinical Features	Outcome of Diaphragmatic Palsy
Kofferath: Ueber einem Fall von rechtseitiger erbscher Lähmung und Phrenikuslähmung nach Zangenextraktion, Monatschr. f. Geburtsh. u. Gynäk. **55**: 33 (July) 1921	Wound of the neck at Erb's point on right side due to forceps	Yes	Shortly after birth; labored breathing, thoracic in type; no fever; fluoroscopic, see-saw movement	Symptoms disappeared at 4 days; at 4 months, right diaphragm high, but no see-saw movement
Friedman, E., and Chamberlain, R. S.: Phrenic Nerve Injury in the New-Born, J. A. M. A. **86**: 934 (March 27) 1926	Forceps	Yes	At 13 days; cyanosis in attacks; respiratory rate increased with irregular rhythm; temperature normal; dulness of lower right lobe; breath sounds feeble, with crepitant râles; roentgenogram: right side of diaphragm high and see-saw movement	At 7 weeks, marked improvement; at 8½ months, normal
Dyson, J.: Paralysis of the Right Diaphragm in New-Born Due to Phrenic Nerve Injury, J. A. M. A. **88**: 94 (Jan. 8) 1927	Accidental laceration of neck while cutting cord about neck	No	During first few days; cyanosis, especially in attacks and on exertion; noisy respirations, dulness and diminished breath sounds, lower right side of chest; temperature normal; roentgenogram: right side of diaphragm high, see-saw movement	Complete recovery at 6 months
Schweizer, F.: Complete Obstetric Paralysis of the Right Brachial Plexus and Paralysis of the Right Phrenic in a Child 2½ Months of Age, Semana méd. **34**: 1098 (Oct. 27) 1927	Traction on the right arm in breech delivery	Yes	On first day; cyanosis, dyspnea and rapid respirations, all accentuated on crying; thoracic respirations and dulness, lower right side of chest, with decreased intensity of breath sounds; roentgenogram: right side of diaphragm high; mediastinum displaced toward normal side	No note
Epstein, J. W.: Diaphragmatic Paralysis Resulting from Injury to the Brachial Plexus, Am. J. Dis. Child. **34**: 634 (Oct.) 1927	Difficult breech extraction	Yes	At birth; cyanosis and rapid, irregular respirations; fever (?); at 3 months, middle of sternum retracted at each inspiration; signs of consolidation, lower right side of chest; roentgenogram; right side or diaphragm high; see-saw movement; heart on left side of chest	At 2¼ years, roentgen evidence still present; occasional attacks of dyspnea; three different attacks of pneumonia

Zeligs, M.: Paralysis of the Right Diaphragm Associated with Brachial Palsy, J. A. M. A. **90**: 762 (March 10) 1928	Difficult breech	Yes	At birth; cyanosis, hard to resuscitate; at 4 months, dulness and depressed breath sounds; lower right side of chest; roentgenogram: right side of diaphragm high; see-saw movement	No note
Mulzer, A.: Paralysis of the Phrenic in Erb's Paralysis in the New-Born. München. med. Wchnschr. **75**: 1498 (Aug. 31) 1928	Forceps; long labor	Yes	At birth; slight asphyxia; roentgenogram: left side of diaphragm high; mediastinal shadow toward the midline; right side of diaphragm moved only slightly	Gradual improvement
Remé, G.: Erbsche Armlähmung und Zwerchfellähmung beim Neugeborenen, Arch. f. Kinderh. **92**: 62 (Nov. 28) 1930	Breech	Yes	At birth; cyanosis and rapid breathing, especially in attacks; difficult drinking after crying; fever (?); heart displaced to right; roentgenogram: left side of diaphragm high and see-saw movements	At 11½ months, see-saw movements gone; left diaphragm still high; cyanosis gone, but rapid breathing left
Tyson-Bowman (case 1, baby C).....	Forceps from occiput posterior position; traction on shoulders	Yes	At 2 hours; cyanosis, irregular respirations, clear spinal fluid; temperature, 100 F.; consolidation, right lower lobe; roentgenogram: see-saw movements; right side of diaphragm high; to-and-fro movement of heart with respiration	Respiratory death at 24 hours
Tyson-Bowman (case 2, baby F).....	Outlet forceps	Yes	At 24 hours; cyanosis; rapid, irregular breathing, in attacks; roentgenogram: right side of diaphragm high; see-saw movement; to-and-fro movement of mediastinal shadow	Symptom-free in 5 days; roentgen evidence disappeared at 2 months
Tyson-Bowman (case 3, baby Y).....	Low forceps after 3 hours of labor	No	At 3 days; dyspnea; irregular respiratory rhythm; roentgenographic but no clinical evidence of atelectasis on right side; at 12 weeks, respiratory indrawing noticed by mother; fluoroscopic study not done until October; at 10 months, see-saw movement noted	Still present at 15 months; only slight improvement
Tyson-Bowman (case 4, baby F).....	Difficult forceps from occiput posterior	Yes	At birth; cyanosis, clearing up at 2 days; recurrence at 26 days; fever present during first attack; roentgenogram at 30 days: fixed high right side of diaphragm	Death
Tyson-Bowman (case 5, baby S).....	High forceps; much traction on neck	Yes	First 24 hours; cyanosis; rapid breathing; no signs of atelectasis	Well on 14th day

side of the chest was less than that of the left, but other than this there was no evidence of a pathologic condition of the lung. The baby could not nurse because of the respiratory embarrassment. Fluoroscope examination at this time revealed the right diaphragm higher than normal, with a typical see-saw movement. There was gradual decrease in the symptoms of brachial and diaphragmatic paralysis. A roentgenographic study done on May 10, 1930, at the age of 2½ months, showed a normally functioning diaphragm. At this time the child was normal as far as one could determine.

This case also has a typical history and sequence of symptoms with complete recovery at two and one-half months.

Case 4.—Baby Y. was born on Jan. 20, 1931, with the aid of forceps after a short labor. The child was apparently normal at birth, weighing 7 pounds and 6 ounces (3,370 Gm.). On its third day the nurse noted that it was listless and breathed with difficulty, but there was no cyanosis. Physical examination of the chest revealed nothing abnormal. Roentgenographic study at this time indicated areas of atelectasis in the left upper lobe and some in the right. No fluoroscopic examination was made. The infant was discharged at 12 days of age in fair condition, with only slight respiratory embarrassment. The baby was brought to the Well Baby Clinic regularly; otherwise normal growth and development were marred by mild rickets and a relatively large head. During this time no irregularity in breathing was observed. The mother noticed, when the child was 12 weeks old, that there was a depression, especially marked on inspiration, of the anterior part of the chest at the lower sternal region. Accompanying this were an increased respiratory rate and diminished breath sounds at the right base posteriorly. Roentgenographic films showed a high right diaphragm and areas of atelectasis. Also there was a wide mediastinal shadow, with some impingement on the tracheal lumen. In spite of the diagnosis of possibly enlarged thymus, made with the aid of roentgenograms, no treatment for this was prescribed. There was improvement in the dyspnea when the child was 4 months of age. At this time a bronchoscopic examination was performed by Dr. L. Clerf, who reported: "The larynx, the trachea and the main bronchi appeared normal; there was no apparent decrease in their size; it was impossible to inspect the orifices of the bronchial subdivisions because of inability to introduce the bronchoscope to that depth. There was no more than the normal amount of secretion observed in the trachea and in the bronchi. This was mucoid in character." Fair progress in development continued, while the dyspnea showed little, if any, improvement. A fluoroscopic examination made when the infant was 6 months old solved the problem, for it showed definite paralysis of the diaphragm. At 1 year of age, there was marked improvement in this child. The size of the depression of the sternum was much reduced, and the patient had a normal respiratory rate and rhythm. Physical examination and roentgenograms at this time showed areas of atelectasis on the right side and deficient diaphragmatic movement on the same side.

Two interesting points are presented by this case: First, it demonstrates the great importance of making fluoroscopic examination in cases of cyanosis in the new-born. It is remarkable that during the observation of this case two roentgen examinations were made, one at 3 days and another at 12 weeks of age, which failed to reveal the cause of respiratory difficulty, but at 6 months a fluoroscopic examination demonstrated paralysis of the diaphragm. Second, what caused injury to the phrenic nerve? There was no accompanying paralysis of the arm, and thus there was probably no injury to the brachial plexus. Possibly there

was sufficient pressure by forceps on the phrenic nerve at Erb's point to produce the damage. Also some type of cerebral injury, especially that evidenced by intracranial hemorrhage, was probably the cause of a central paralysis.

This case is a valuable illustration of an early supposition which we entertained that many cases of paralysis of the diaphragm produce only slight respiratory embarrassment and clear up without the true diagnosis being suspected.

CASE 5.—Baby S., weighing 9 pounds and 2 ounces (4,185 Gm.) at birth, was delivered on March 1, 1932, with mid-forceps application. There was considerable difficulty in manipulating the left shoulder, in that great stress was exerted to bring it to impinge under the pubic bone. At birth the baby was cyanotic, with slow and shallow respirations and a slow and regular heart beat. Alpha lobeline and epinephrine were used hyperdermically, with improvement. Twenty cubic centimeters of whole blood from the mother was given intramuscularly. The patient nursed well from the first time he was fed. Left-sided brachial

TABLE 2.—*Summary of Important Data in Reported Cases (Number of Babies, 13)*

		Cases
I. Type of delivery		13
A. Forceps	8	
B. Breech	5	
II. Symptoms		
A. Time of onset: 1. At birth		6
2. First 24 hours		4
3. From 2 to 13 days		3
B. Type: 1. Attacks of respiratory difficulty		4
2. Cyanosis		9
3. Rapid irregular breathing		8
4. Fluoroscopic, see-saw movement		10
III. Outcome		
A. Complete recovery at 6 months		4
B. Symptoms present at 6 months		5
C. Death		2
D. No data		2

paralysis was noted on the second day. Forty-six hours after delivery, the baby had a generalized clonic convulsion lasting seven minutes, and in the following few hours there were three more. Physical examination at this time showed marked cyanosis and choking respirations. Cisternal puncture during the second day revealed clear fluid under 12 mm. of pressure. Paralysis of the left side of the diaphragm with typical see-saw movement was reported by Dr. P. A. Bishop after fluoroscopic examination. The respiratory symptoms improved gradually, and on the seventh day after birth, the fluoroscope showed a slightly high but perfectly mobile left diaphragm. The baby was discharged in fair condition on the eleventh day, without signs of respiratory embarrassment, but with a persistence of the brachial paralysis. It appears that the cause of the injury to the phrenic nerve in this case was the excessive stress on the neck while the left shoulder was being manipulated.

ETIOLOGY

The thirteen cases recorded represent an interesting and unusual condition of the new-born characterized by respiratory distress of varying grades due to paralysis of the diaphragm on one side. The injury is usually caused by stretching or tearing of the phrenic nerve as in

obstetric manipulation of the shoulder and arm, or by direct pressure of forceps on the nerve at Erb's point in the neck. Obviously the delivery in these cases is, as a rule, difficult, although several cases are reported following easy births. Brachial paralysis on the same side usually accompanies the diaphragmatic paralysis. The phrenic nerve arises in part from the third, fourth and fifth cervical nerves, which make up part of the brachial plexus. Thus injury to the brachial plexus, from stretching, tearing or pressure, may damage the phrenic nerve at its origin. Of course, brachial paralysis in the new-born is much more common without than with evident injury to the phrenic nerve.

SIGNS

The time of onset of signs of paralysis of the diaphragm in the new-born varies, but it is usually during the first twenty-four hours

Fig. 1.—Kleinbock phenomenon or paradoxical action of diaphragm.

following delivery. Respiratory difficulty, which is gradual in appearance when not present at birth, is the first sign. This is evidenced by cyanosis and rapid breathing, irregular in rate, rhythm and depth. The degree of cyanosis typically varies. In addition, the respirations are of thoracic type and jerky.

Inspection of the chest further reveals evidences of impaired function of the affected side. Here expansion is diminished, and there is lack of expiratory bulging of the abdomen in contrast to the fully expanding, healthy side. Inspiratory indrawing of the sternum may be present after the condition has been established for some time. In most cases on percussion and auscultation there are evidences of atelectasis on the paralyzed side, especially at the base of the lung.

The general condition of these infants varies, of course, with the extent of the injury. Usually the baby is fretful and refuses to nurse, or possibly cannot because of the difficulty in breathing. Sometimes there is moderate fever.

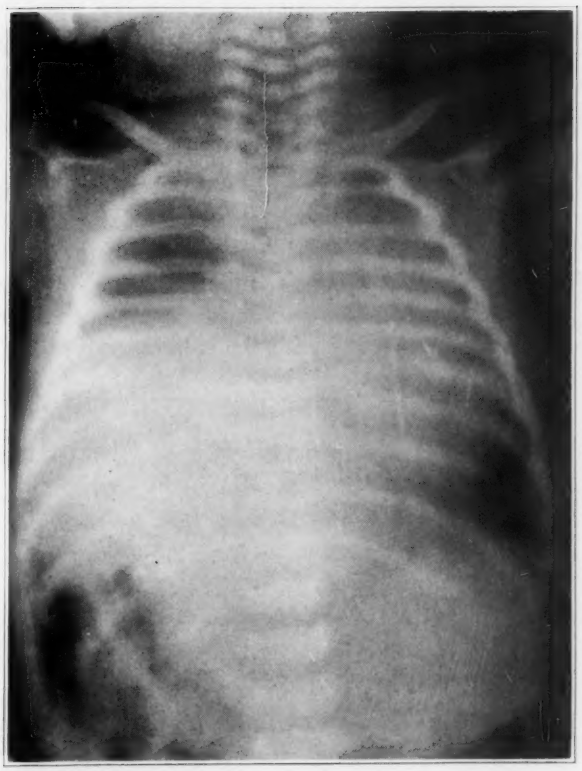

Fig. 2 (Baby David L.).—Roentgenogram of chest, showing high right diaphragm, heart displaced to left and left diaphragm depressed.

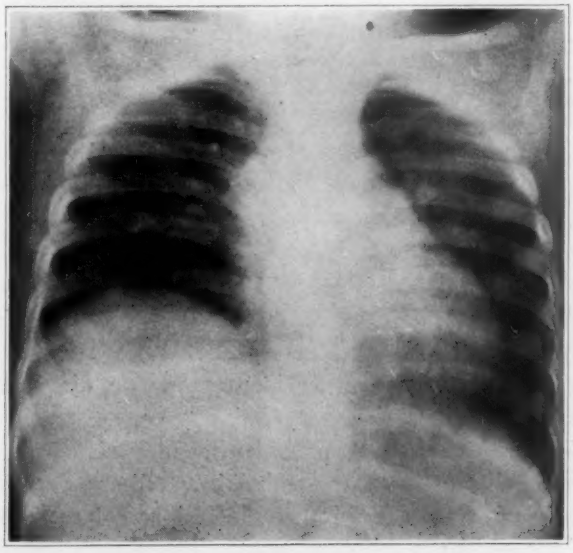

Fig. 3 (Baby C.).—Roentgenogram showing high right diaphragm and heart displaced to left.

The roentgenogram, especially in the fluoroscopic examination, gives absolute proof of the presence of the condition. Films show a high diaphragm and areas of atelectasis on the affected side, and the heart displaced toward this side. Fluoroscopy reveals the diagnostic paradoxical or "see-saw" movement, sometimes called the Kleinbock phenomenon. In this the paralyzed side ascends during inspiration and descends during expiration, while the unimpaired side pursues normal excursions. Also observed under the fluoroscope is a to-and-fro movement of the mediastinal contents with the respiratory cycles.

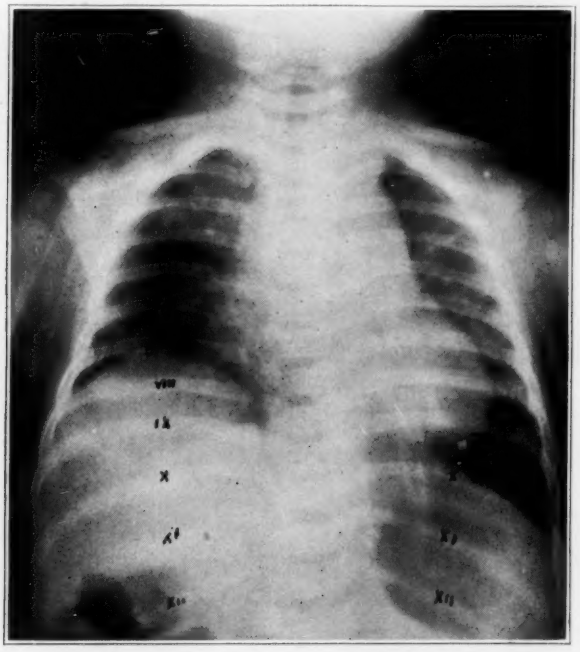

Fig. 4 (Baby Y.).—Roentgenogram showing persistence in equality of diaphragms at 6 months of age.

DIAGNOSIS

Paralysis of the diaphragm should be suspected in every new-born baby with brachial paralysis, especially if there is accompanying respiratory embarrassment. All such cases should be studied under the fluoroscope, and if the condition is present, the diagnostic see-saw movement will be observed.

Conditions which may be confused with paralysis of the diaphragm are intracranial hemorrhage, congenital heart disease, atelectasis, diaphragmatic hernia, acute respiratory infection, enlarged thymus and malformations of the respiratory tract. The distinction from intra-

cranial hemorrhage may give great difficulty, since they both usually occur following long, hard deliveries. The cyanosis in hemorrhage is usually intermittent, tending to increase if pressure is not relieved. Bloody spinal fluid under increased pressure is diagnostic. Continuous cyanosis accompanied by cardiac murmurs is important in recognizing congenital heart disease. Careful roentgen studies and bronchoscopic examinations are important in enlarged thymus and congenital malformations. In all cases the absence of the see-saw movement eliminates the possibility of paralysis of the diaphragm.

TREATMENT

Little can be done for babies with paralysis of the diaphragm besides general supportive measures and careful feeding. Prophylaxis may be mentioned for the benefit of those who have to do with obstetrics.

PROGNOSIS

The outlook in this condition depends, of course, on the severity of the injury. Among the twelve cases reported, the mortality was 16 per cent. In most of the remaining cases there was slow recovery from the major symptoms, although some evidence of faulty action of the diaphragm was present during the first year. It was seen that infants with paralysis of the diaphragm are more susceptible to respiratory infection.

CONCLUSIONS

1. Twelve cases of paralysis of the diaphragm in the new-born are presented.

2. The cause is injury to the phrenic nerve is obstetric manipulation.

3. The signs are cyanosis, irregular respiratory rate and rhythm usually appearing in the first days after delivery. Usually there is an accompanying brachial paralysis.

4. The "see-saw" or paradoxical movement of the diaphragm as observed under the fluoroscope is diagnostic.

5. The prognosis is good with regard to life; the mortality was reported as 16 per cent.

FURTHER ROENTGENOGRAPHIC STUDIES OF THE CHESTS OF CHILDREN DURING MEASLES

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AND
HENRY KOIRANSKY, M.D.
NEW YORK

In previous papers [1] we reported the observations on successive roentgenograms of the chests of 130 children with measles. It was shown that shadows suggesting pulmonic infiltration were present in 62.4 per cent of the patients less than 4 years of age and in 42.2 per cent of the patients 4 years of age or over. In the cases showing infiltration, this was present in at least 61 per cent before or during the height of the eruption. The infiltration was often present in cases that were considered clinically mild. Abnormal intensity of the pulmonary markings, pleuropulmonary changes and progressive and retrogressive hilar changes were also present. The enlargement of the hilar shadow was presumably due mainly to engorgement of the blood vessels, and to a lesser extent to swelling of the hilar lymph nodes. Viethen [2] found similar changes during measles and showed that the pulmonary infiltration persisted without any rise in temperature for a long time after measles, the children making an uneventful recovery.

When 56 of our patients returned for reexamination from six to ten months after having had measles, the roentgenograms of the chest were found to be normal except for additional pleural involvement in many cases.

The roentgen methods at the Willard Parker Hospital were similar to those used in the previous studies. Whenever possible, successive roentgenograms were taken every few days during the patient's stay in the hospital. A physical examination was made whenever a roentgenogram was taken.

The roentgen technic employed at the Willard Parker Hospital was as follows: The exposures were made at a distance of 91.5 cm.

From the Willard Parker Hospital for Contagious Diseases, Department of Hospitals.

1. Kohn, J. L., and Koiransky, H.: Successive Roentgenograms of the Chest of Children During Measles, Am. J. Dis. Child. **38**:258 (Aug.) 1929; Roentgenographic Reexamination of the Chests of Children from Six to Ten Months After Measles, ibid. **41**:500 (March) 1931.

2. Viethen, A.: Klinische und röntgenologische Lungenuntersuchungen masernkranken Kinder, Klin. Wchnschr. **10**:2072 (Nov. 7) 1931.

(36 inches), using a 15 cm. (6 inch) point spark gap with a voltage of 55 kilovolts and 100 ma. of current. The time of exposures was one tenth of a second. Except in a few instances, both the postero-anterior and the direct lateral roentgenograms were taken with the patients in the sitting position.

Because of the tendency of young children to move, we devised an immobilizing apparatus for taking roentgenograms of the chest in the sitting position. It obviates the necessity of a nurse holding the patient and risking overexposure to roentgen rays. A detailed description of this apparatus has been published elsewhere.[3]

ROENTGENOGRAMS TAKEN IN THE LATERAL POSITION

In the present studies, in addition to taking roentgenograms of the chest in the postero-anterior positions, the direct right and left lateral positions were used. With the use of these special positions, the resultant roentgenograms gave a clearer visualization of the lymph nodes of the posterior mediastinum and those localized at the bifurcation of the trachea. The lateral exposures also enable one to ascertain a pleural involvement in the region of the interlobar fissures between the various lobes. One may also occasionally see a retrosternal opacity along the anterior wall of the chest close to the base, which probably represents a pleural effusion. This opacity was continuous with a shadow extending to the hilar region in the anatomic position of the interlobar fissures between the upper and lower lobes.

Material.—This study is based on the examination of 59 children who were admitted to the Willard Parker Hospital because of measles. Only children admitted during the preeruptive or eruptive stages are included in this series.

The children were from 1 to 10 years of age. Twenty-eight were less than 4 years of age and 31 were 4 years or older. There were 30 boys and 29 girls. Ten of the children were Negroes, and the others were white or of Porto Rican parentage. In all, 224 roentgenograms were studied. Of these, 120 were taken in the postero-anterior position and 104 in the lateral position. In 33 cases, 2 or more lateral exposures were obtained. In 1 case the first roentgenogram was taken in the preeruptive stage, in 13 during the early eruptive stage, in 30 during the height of the eruption and in 15 during the recession of the eruption. There were 2 deaths.

We feel reasonably certain that none of these patients had been infected with tuberculosis. The findings in 20 cases of tuberculosis

3. Kohn, J. L., and Koiransky, H.: Immobilizing Apparatus for Taking Chest Roentgenograms in Young Children, Am. J. Roentgenol. **25**:100 (Jan.) 1931.

discovered during the course of this investigation have been published separately.[4]

Lymphatic Involvement.—As was stated previously, there are important advantages in using the lateral position for visualization of some of the hilar lymph nodes. In children with measles, opacities were clearly visible in the anatomic position of the lymph nodes, located in the region of the bifurcation of the trachea and the posterior mediastinum. In normal children only small indefinite opacities were seen in these areas.

During measles these opacities were large, dense and usually irregularly elliptic in form (figs. 3, 5, and 7). They were present in nearly

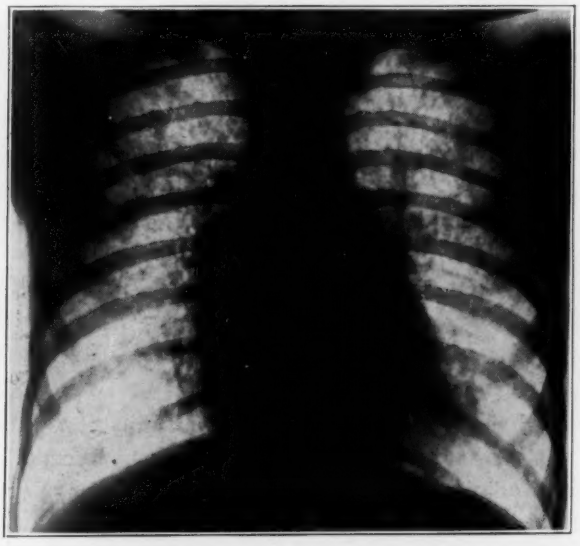

Fig. 1.—Appearance of the lungs of M. C., aged 7 years, on April 21, during the height of the measles eruption. The temperature was high. The child had moderate dyspnea. Coarse and fine râles but no bronchial breathing were heard over both lungs. The roentgenogram shows an enlarged dense hilar shadow with a large number of small opacities throughout both lung fields. The appearance of the roentgenogram is suggestive of tuberculosis, but all tests for tuberculosis gave negative results.

every case. In the cases in which 2 or more lateral exposures were obtained, the maximum size and density of these opacities were seen during the eruptive period and most frequently during the height of the eruption (figs. 3 and 7). In only 3 cases were the opacities considered

4. Kohn, J. L., and Koiransky, H.: The Relations of Measles and Tuberculosis in Young Children: A Clinical and Roentgenographic Study, Am. J. Dis. Child., **44**:1187 (Dec.) 1932.

small during the eruptive stage. In only 1 case was the maximum seen in the posteruptive period. As the measles subsided, these opacities became smaller and less discrete. The work of Le Marc'hadour, Dupire and Loé [5] confirms the impression that these enlarged nodes are not permanent. In a roentgen study of children in whom they used both the postero-anterior and the lateral position, enlarged hilar nodes were not found in cases with a previous history of pertussis or measles.

The presence of pneumonic infiltrations, judging by the roentgenograms, had little, if any, influence on the size or the density of the lymphatic opacities. In 27 of the 59 cases there was no roentgen evidence of pulmonary infiltration. In spite of the absence of pulmonary

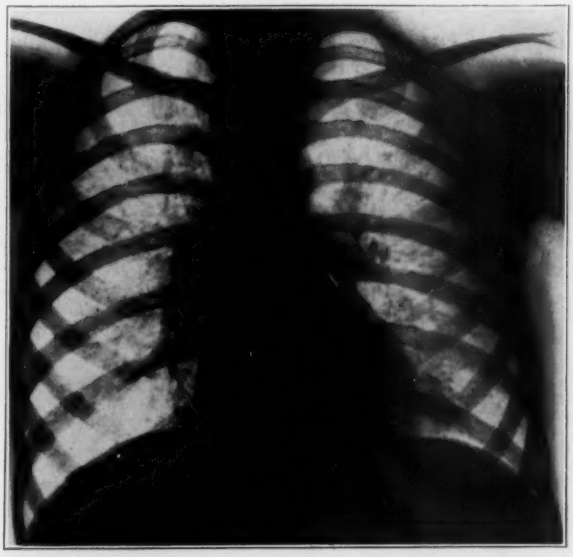

Fig. 2.—Roentgenogram taken on April 30. The temperature had been normal for five days. Very few scattered coarse râles were still heard. The roentgenogram showed marked clearing of the pulmonary opacities. A few small calcified nodes were seen in the left hilar region.

infiltration the lymph nodes were considered enlarged in all but 3 of the cases. Where enlarged nodes appeared in association with pneumonic infiltrations, the size of the nodes varied independently of the subsequent course of the pneumonic process. As stated, the hilar glands in nearly every case attained their maximum size during the eruptive stage. The size of the roentgen opacities, owing to the lymph nodes, decreased

5. Le Marc'hadour, P.; Dupire, P., and Loé, R.: Contribution à l'étude de l'adénopathie trachéo-bronchique chez l'enfant: Etude comparée des signes clinique et des images radiologiques, Paris méd. **2**:441 (Nov. 28) 1931.

even though the pneumonic process was progressive. In only 1 case did the nodes attain their maximum size during a progressive pneumonia. The relation of the involvement of the lymph nodes and the stage of the pneumonic process will be discussed later.

The opacities were most frequently seen below and in front of the bifurcation of the trachea. In only 9 cases was there any involvement in the posterior mediastinum, and when present it was usually seen in the lower part.

Fig. 3.—A left lateral view of M. C., taken on April 24. This shows a dense ribbon-like opacity running across the lung from the vertebra downward and forward to the sternum, in the plane of the interlobar fissure between the left upper and left lower lobes. There are also moderate sized, dense, elliptic opacities in front, below and behind the bifurcation of the trachea.

It was shown in another study [4] that the roentgen findings are quite different when young tuberculous children contract measles. The lymphatic opacities in the tuberculous children were larger, denser and more sharply defined and receded much more slowly. The opacities often hid part of the trachea, and involvement of the nodes in the posterior mediastinum was present in every case.

Pleural Changes.—In our previous study [1] 26 per cent of the cases showed evidence of pleural involvement. On reexamination from six to ten months later, additional patients showed pleural involvement.

In the present series, with the use of the lateral exposures, thickening of the pleura, as indicated by visibility of the interlobar fissures between the various lobes, was seen in 11 cases. In 3 of these cases it was present on the first roentgenogram, and in 8 on subsequent ones. This visibility of the fissures was made out as a fine line in all

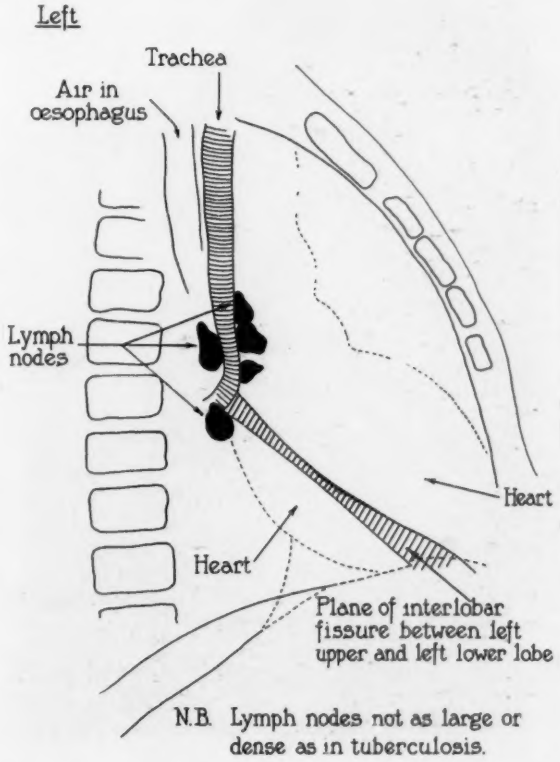

Fig. 4.—Diagrammatic sketch of the roentgenogram shown in figure 3.

but 3 of the children. In 1 of the 3 latter cases a ribbon-like opacity extending along the entire plane of the interlobar fissure was seen (fig. 3). In the other 2 cases there was a large triangular opacity at the site of the interlobar fissure, between the right upper and right middle lobes (fig. 7). These large pleural opacities were first present during the eruptive stage and were presumably due to an interlobar pleurisy. This triangular opacity is sometimes confused with pneumonia of the right middle lobe. Evidence of pneumonia of the middle lobe on the postero-anterior roentgenograms is helpful in making a differentiation.

Subsequent roentgenograms showed that these large opacities gradually diminished until only a fine line was seen (fig. 5). In 2 cases, in addition to the visibility of the interlobar fissures, a retrosternal pleural opacity was seen.

Comments.—The most striking facts revealed in this study of the pulmonary system of 59 children with measles was the frequent roentgen evidence of lymphatic and pleural involvement.

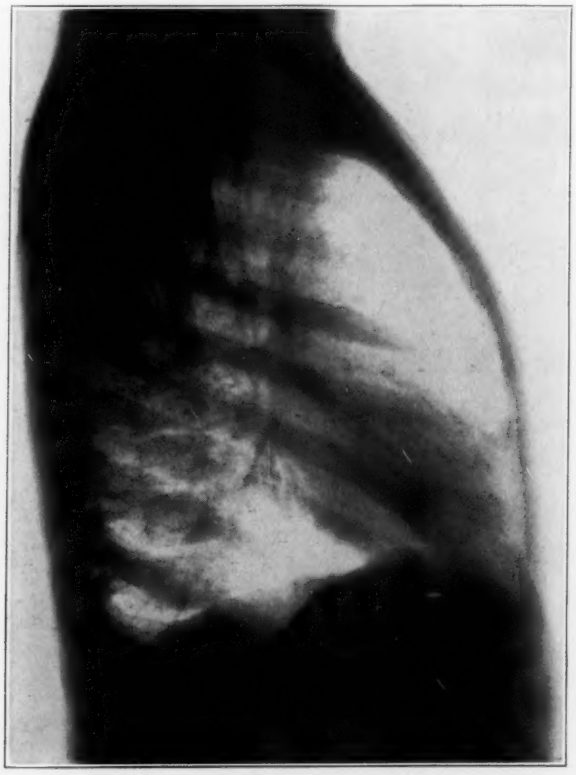

Fig. 5.—Left lateral view of M. C., taken on April 30, the same day as figure 2. At the site of the ribbon-like opacity, a fine line is now seen. The dense opacities shown below and behind the bifurcation of the trachea are much smaller.

W. S. Miller [6] showed that the lymphatics of the lung are a closed system of vessels and can be divided into a superficial and a deep set. The superficial set is situated in the pleura, and the deep set accompanies the bronchi, the pulmonary artery, with its ramifications, and the

6. Miller, W. S.: Lymphatics and Lymph Flow in the Human Lung, Am. Rev. Tuberc. **3**:193 (June) 1919; Key Points in Lung Structure, Radiology **4**:173 (March) 1925.

pulmonary veins. The two sets of lymphatics are in communication with each other at the hilus of the lung. So far as is known, no definite lymph nodes are present distal to the large bronchi.

Under normal conditions the drainage within the lung is toward the hilus; that is: (1) The deep lymphatics drain the lung from the region of the bronchiole along the bronchi and vessels toward the hilar nodes; (2) the superficial or pleural lymphatics drain the peripheral portion of the lung. They form an irregular network over the whole surface of the pleura. Numerous valves are present in the pleural lymphatics, preventing backward flow into the lung. Thus, under normal conditions,

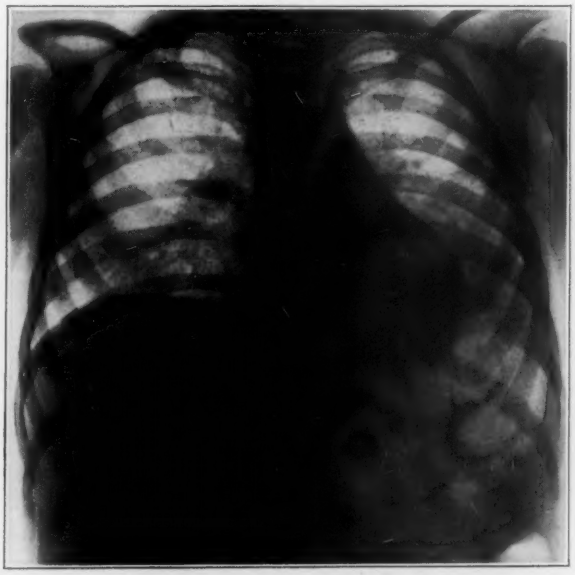

Fig. 6.—Appearance of the lungs of L. G., taken on March 10, during recession of the measles eruption. The temperature was high. At the base of the left lung fine moist râles were heard; at the base of the right lung bronchial breathing was heard. The roentgenogram shows a large infiltration at the base of the left lung and also a much smaller infiltration, just above the diaphragm, at the middle section of the right lung. The hilar shadows are enlarged.

there is free and uninterrupted drainage from the pleura over the surface of the lung to reach the hilar nodes.

In every case of measles, be it mild or severe, there is probably peribronchial infiltration. Microscopically, in an early case one sees an interstitial inflammatory process, which starts in the fibrous coats of the bronchioles. The inflammatory process spreads to the terminal atria and alveoli of the bronchiole involved, and to some extent through the peribronchial tissues into the adjacent alveoli. These processes lead to dilatation of the lymphatics and to enlargement of the hilar nodes.

It is well known, as shown by necropsy, that the hilar lymph nodes are enlarged in every case of bronchopneumonia regardless of the specific organism causing it. Blake and Cecil [7] have shown that in the experimental pneumonia of monkeys engorgement of the lymphatics and enlargement of the hilar nodes are present early after the onset of symptoms. So far as is known, no one mentions the relative size of the hilar nodes during the various stages of a pneumonic process. Therefore, we believe it fair to assume that the frequent roentgen findings of enlarged lymph nodes during measles is evidence either of peribronchial or of pulmonary involvement.

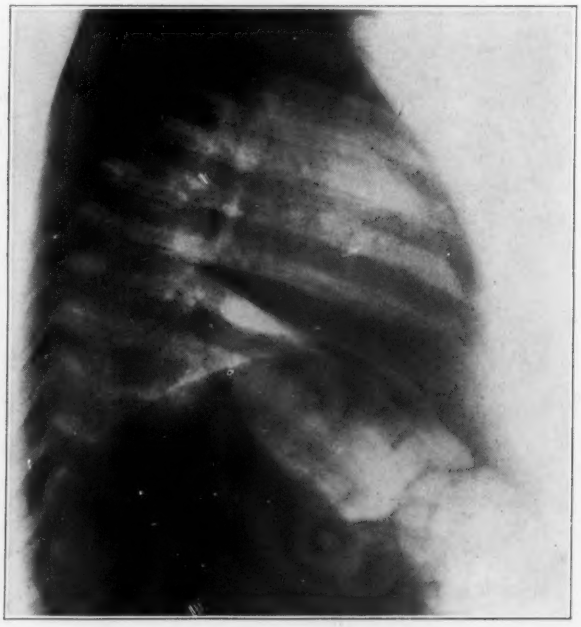

Fig. 7.—Right lateral view of L. G., taken on March 10, the same day as figure 6. This shows a large triangular opacity running across the lung downward and forward from the vertebra to the sternum at the site of the interlobar fissure between the right upper and right middle lobes. This shadow persisted for about three weeks, gradually growing smaller. There was no fever after March 14. There were also moderate-sized, dense opacities in front and behind the bifurcation of the trachea.

Pleural changes during measles are also frequent and are occasionally found in cases considered clinically mild. However, in the cases with

7. Blake, F. G., and Cecil, R. L.: Pathology and Pathogenesis of Pneumococcus Lobar Pneumonia in Monkeys, J. Exper. Med. **31**:445 (April) 1920; Pathology of Experimental Influenza and Bacillus Influenzae Pneumonia in Monkeys, ibid. **32**:719 (Dec.) 1920.

pleural involvement there is usually roentgen evidence of pulmonary infiltration. Whether the pleural reaction is secondary to an adjacent alveolar inflammation or whether it is primary, we cannot say.

ROENTGENOGRAMS OF CHILDREN UNDER ONE YEAR OF AGE

In our first study [1] of 130 children, there were only 11 children under 1 year of age. We are, therefore, reporting 23 additional cases. Six patients were 6 months of age or under, and 17 were from 7 to 12 months.

The results, however, are the same as in the first group. The shadows suggesting pulmonary infiltrations were seen in 15 cases, or

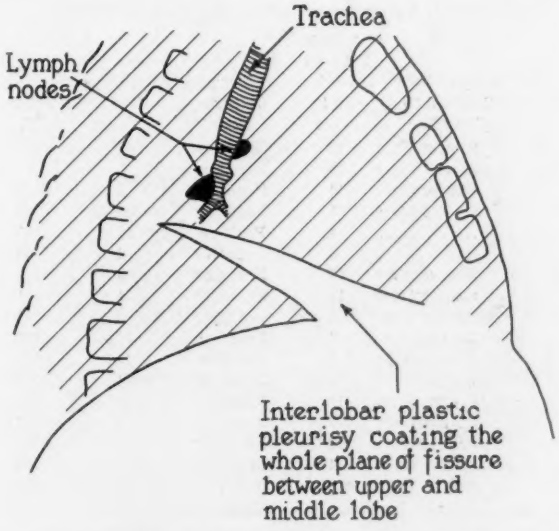

Fig. 8.—Diagrammatic sketch of roentgenogram shown in figure 7.

62.5 per cent. In the other 8 cases, diffuse nonconfluent mottling was seen throughout both lung fields, especially in the inner and mesial parts of the lung. Except for 1 case the pulmonic infiltration was already present during the eruptive stage. Ten of these patients were considered seriously ill; 3 of them died.

ROENTGENOGRAMS OF CHILDREN WHO RECEIVED IMMUNE SERUM BEFORE THE ONSET OF MEASLES

In our previous papers we studied the roentgenograms of the pulmonary systems of children with unmodified measles. In a large percentage of cases pulmonary infiltrations were found. We thought it might be instructive to make a similar study of children exposed to

measles who had received convalescent serum or an adequate amount of whole blood from adults previously infected with measles. As is well known, if the immune serum or blood is given no later than six days after exposure, the resultant measles is usually mild and of a modified form, and the incubation period is prolonged.

In all, 17 cases were studied, too few to be of value for statistical purposes. However, a critical analysis of these cases reveals some interesting results.

From the accompanying table it can be seen that in 13 cases during the measles there was no roentgen evidence of pulmonary infiltration.

Cases in Which Patients Received Convalescent Serum

Case	Age in Years	Illness When Exposed to Measles	No. Days Between Injection and Fever	Lung Infiltrations	Fever		Course of Measles
					No. Days During Measles	Maximum, F.	
1	1½	Scarlet fever	16	Negative	2	102	Mild
2	1½	Scarlet fever	10	Negative	5	102	Mild
3	2	Scarlet fever	14	Negative	5	103	Mild
4	2	Scarlet fever	5	Negative	2	102	Mild
5	3	.....	4	Positive	11	105	Severe
6	3	.....	6	Negative	2	103	Mild
7	3	Scarlet fever	16	Negative	3	102	Mild
8	3	Scarlet fever	18	Negative	4	101	Mild
9	3	Scarlet fever	6	Negative	6	102	Mild
10	4	Pertussis	2	Positive	10+	105	Severe
11	4	Pertussis	8	Positive	10+	105	Severe
12	5	Pertussis	6	Positive	14	104	Severe
13	5	Scarlet fever	11	Negative	6	104	Mild
14	5	Scarlet fever	13	Negative	6	104	Mild
15	5	Scarlet fever	12	Negative	5	102	Mild
16	5	Scarlet fever	12	Negative	5	104	Mild
17	6	Scarlet fever	13	Negative	2	102	Mild

In all of these cases the course of illness was mild, the average duration of fever being four days, essentially modified measles.

However, even in these cases of modified measles there was roentgen evidence of enlarged hilar shadows, increased pulmonary markings and scattered nonconfluent mottling, especially in the inner and mesial part of the lung field.

In 10 of the patients without pulmonary infiltration, the first day of fever occurred from eleven to eighteen days after the giving of serum. In the 3 remaining children the first day of fever occurred five, six and eight days after the giving of serum. Taking the onset of symptoms as a beginning of illness, the incubation period for measles is usually from twelve to fourteen days. If the patients under observation are in an institution and one considers the first day of fever as the day of onset, the incubation period is usually ten days.

In only 4 cases was there clinical and roentgen evidence of pulmonary infiltration. Clinically, these children were severely ill. In 2 of the 4 cases the serum was evidently given late, since the onset of symptoms occurred two and four days after the giving of serum. In the other 2 the first day of fever was six and eight days afterward, respectively. Three of these children had pertussis when exposed to measles, and of these 3, 1 had pulmonary infiltration during the pertussis. The relationship of concomitant pertussis and measles to the occurrence of a pulmonary infiltration cannot be evaluated at this time.

From these cases one gets the impression that if convalescent serum or suitable whole blood is given early enough after exposure the subsequent measles is mild, and roentgenographic evidence of pulmonary infiltrations is less likely to be found.

NECROPSY ROENTGENOGRAMS OF THE LUNGS OF CHILDREN DYING OF MEASLES

Necropsies in the early stage of measles are few. Denton [8] had the rare opportunity of studying the pathologic process in a number of early severe fatal cases of measles during an epidemic in the Canal Zone. His observations correspond closely with those of MacCallum,[9] Koester,[10] Feyrter [11] and others. Smith [12] has recently reported an autopsy on a patient with mild measles who died of renal insufficiency due to a congenital deformity. The gross appearance of the lungs of children dying soon after the appearance of the eruption usually shows innumerable tiny red points varying in size from a fraction of a millimeter to 1 mm. These spots are so small that their relationship to sizable vessels and bronchial radicals could not be determined with the naked eye. In children dying later in the disease, these areas were larger, and in some places they coalesced to form a visible pneumonic consolidation.

The microscopic picture during measles has already been described in this paper. It is mainly a peribronchial inflammation with involvement of the terminal atria and alveoli of the bronchioles. The inflammatory cells are mainly of the mononuclear variety. Even the mild case reported by Smith shows this pathologic picture (fig. 9).

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8. Denton, J.: Pathology of Early Measles, Am. J. M. Sc. **109**:531 (April) 1925.

9. MacCallum, W. G.: Pathology of Pneumonia in the U. S. Army Camps During Winter of 1917-1918, New York, Rockefeller Institute of Medical Research, Monograph no. 10, 1919.

10. Koester: Masern Pneumonie, Deutsche med. Wchnschr. **24**:8, 1898.

11. Feyrter, F.: Ueber die masern Pneumonie, Virchows Arch. f. path. Anat. **255**:753 (Aug.) 1924.

12. Smith, L. W.: Congenital Absence of One Kidney with Associated Urethrorectal Fistula and Concomitant Measles, Am. J. Dis. Child. **42**:1417 (Dec.) 1931.

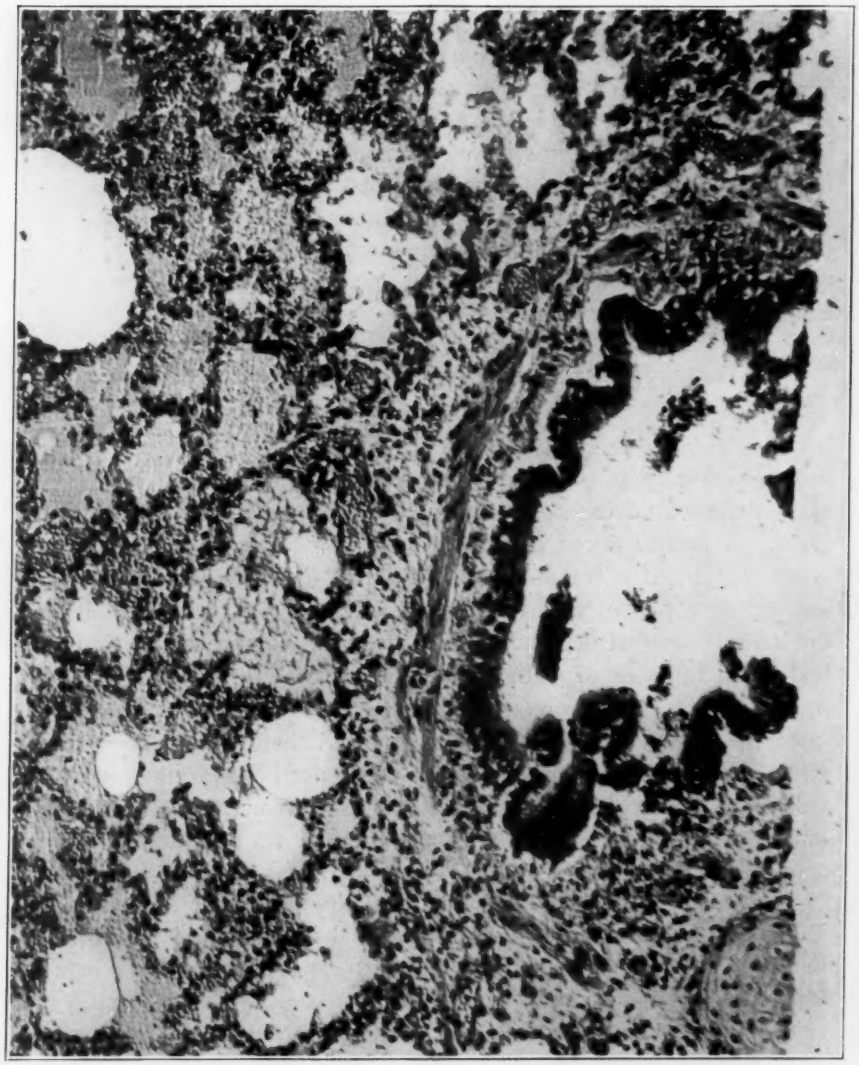

Fig. 9.—Photomicrograph of the lung of a child who died of uremia during a mild attack of measles five days after the first appearance of the eruption; × 160. Peribronchial infiltrations are present. The inflammatory cells are mainly of the mononuclear variety. In the peripheral portions a terminal hypostatic pneumonia is shown. (From Dr. L. Smith's case.)

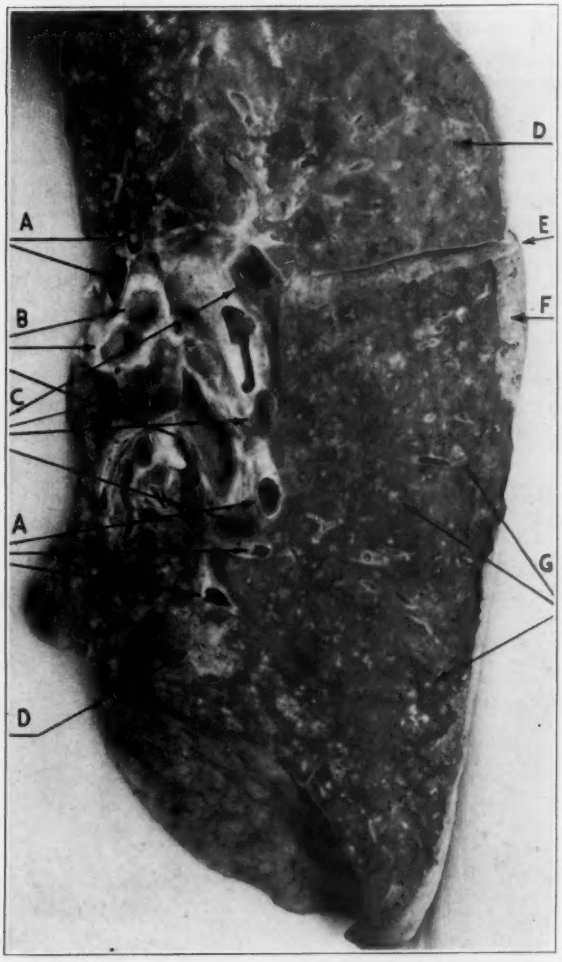

Fig. 10.—Gross specimen of the right lung of Z. G., aged 15 years, who died ten days after the onset of measles. The child had a high fever and was very sick from the onset of illness. There were physical signs of diffuse bronchopneumonia. The specimen shows innumerable small opacities scattered throughout the lung. Very few large confluent pneumonic patches are seen. One can also see bronchi filled with exudate, enlarged hilar lymph nodes, dilated blood vessels, some of which contained thrombi, and thickening of the entire visceral pleura. The interlobar fissure is also shown. *A* indicates thrombi; *B*, acute bronchitis; *C*, lymph nodes; *D*, pneumonic patch; *E*, interlobar septum; *F*, pleural thickening; *G*, peribronchial thickening with bronchiolitis, monocytic infiltration and interstitial pneumonitis.

We thought it might be instructive to take necropsy roentgenograms of the lungs of children dying of measles, and to compare them with the pathologic material. The roentgenograms of these lungs were taken immediately after their removal from the body.

Fig. 11.—Photomicrograph of the lung of the same child as in figure 10; × 4½. There is peribronchial infiltration but no infiltration around the blood vessels. *A* represents a bronchiole filled with exudate.

The gross specimen shown in figure 10 is typical of children dying fairly early in measles. The lungs in this case were voluminous. They had a mottled purplish-red color. Scattered throughout the lung were innumerable grayish areas, varying in size from 1 to 5 mm., and they could be described as a diffuse peribronchial pneumonitis. Coalescence

of these areas produced a definite pneumonic patch. Very few pneumonic patches were seen. Secondary marginal atelectatic and emphysematous patches were found scattered in the lower posterior portion of the lungs. The visceral surface of the pleura was grayish, thickened and sticky, with a few adherent strands of fibrin found particularly between the interlobar septums. The hilar nodes were greatly enlarged, hyperplastic and congested, but no definite evidence of tuberculosis could be

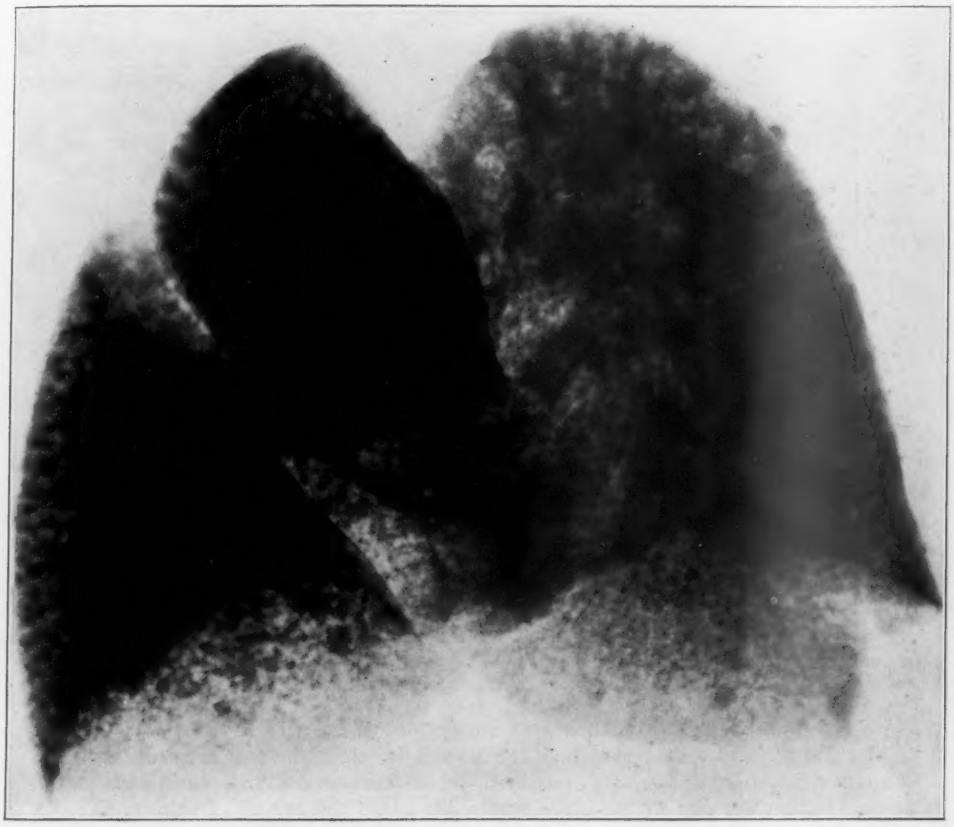

Fig. 12.—Necropsy roentgenogram of the lungs of the child in figures 10 and 11. Innumerable small dense opacities of varying size are scattered throughout both lungs. There is not much tendency of these opacities to coalesce and form large confluent areas.

made out. The trachea and bronchi were filled with mucopurulent material. Some of the medium-sized blood vessels were found to be filled with thrombi.

Microscopically, sections through the various parts of the lungs presented somewhat different pictures. The predominating appearance

was that of typical measles (fig. 11). This consisted of marked peribronchial thickening, chiefly as the result of mononuclear cellular infiltration. The cells were both small lymphocytes and large reticuloendothelial cells. The process had extended to produce an interstitial pneumonitis, again with the exudate predominantly of mononuclear cells. It was associated with a definite acute tracheobronchitis which extended to the finer divisions of the bronchial tree. Here, the lumens contained a fibrinopurulent exudate, with a marked increase in mucus as well. The mucosa was intensely injected, with marked dilatation of the

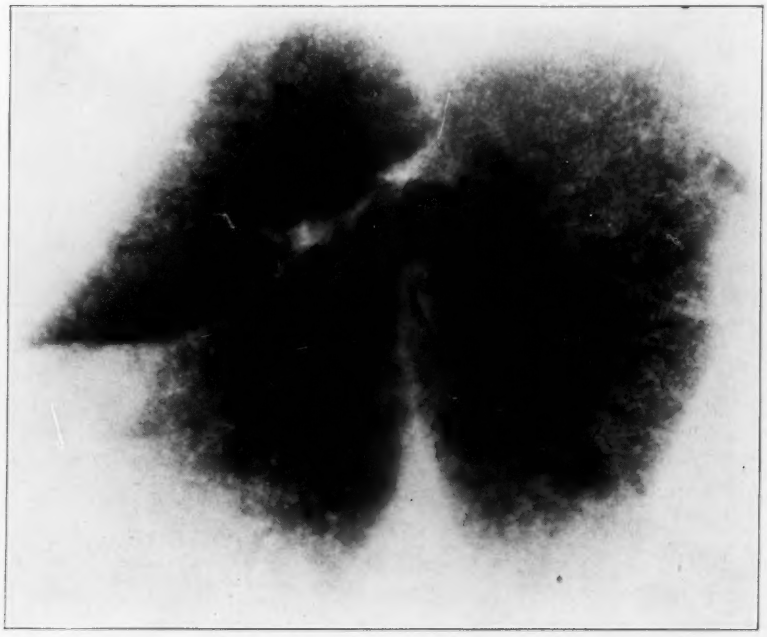

Fig. 13.—Roentgenogram taken at necropsy of J. S., aged 2 years, who died of miliary tuberculosis. The child had been ill for three weeks. The roentgenogram shows innumerable small opacities. When compared with those in measles, the opacities are smaller and more evenly distributed and are all of uniform size.

capillary vessels. Considerable desquamation of the superficial epithelium was noted.

In addition to the picture of measles, there was a definite secondary bronchopneumonia with focal areas where the alveoli were filled with fibrin and leukocytes. In places this fibrinous exudate was extremely prominent, occurring as a layer of densely staining strands, closely adherent to the alveolar surface. It was impossible to say whether this represented a direct extension of the bronchiolitis and interstitial pneumonitis or whether it represented an independent secondary infection.

The regional nodes in the hilus and peribronchial region showed the same diffuse mononuclear reaction, with marked hyperplasia of these cells. The lymph follicles were distorted as a result of the mononuclear reaction. The nodes, in addition, showed marked injection and, in general, lymphoid hyperplasia.

The necropsy roentgenograms in these cases showed innumerable small opacities scattered throughout both lungs. These opacities were presumably due to pneumonic infiltrations (fig. 12). Because of the superimposition of overaerated and underaerated patches of lung tissue, the approximate size of these opacities could not be estimated. One gets the impression from the roentgenogram, however, that there are so many of these opacities that the total air-containing capacity of the lung is greatly reduced.

When the roentgenogram in a case of measles was compared with one taken in a case in which the patient died of lobar pneumonia, the difference was easily seen. In the case of lobar pneumonia, there was a large dense homogeneous opacity of the lobe involved. This opacity was due to a complete pneumonic consolidation of the lobe. In the uninvolved lobe there was normal aeration with no opacities.

We thought it helpful, also, to compare the roentgenograms in the cases of measles with those of a child dying of miliary tuberculosis. The opacities cast by these miliary tuberculous infiltrations were smaller and more evenly distributed, and all of them were uniform in size (fig. 13).

The patients dying of measles were 2½ and 15 years of age. Both children were seriously ill from the onset of the disease, and physical signs of a disseminated bronchopneumonia were found early. The younger child died eight days, and the older one ten days, after the onset of symptoms.

SUMMARY

1. Roentgenograms of the chest of 59 children between the ages of 1 and 10 years were taken in various stages of measles. Lateral as well as postero-anterior positions were used in taking the roentgenograms.

2. Using the lateral position, enlargement of the lymph nodes localized in front and below the bifurcation of the trachea and occasionally of those in the posterior mediastinum was found in nearly every case. The maximum enlargement of the lymph nodes was seen most frequently during the height of the eruption.

3. With the lateral position there was evidence of a pleural involvement in 11 cases. This was usually shown by a visibility of interlobar fissures between the various lobes.

4. With the lateral position the enlarged lymph nodes were present irrespective of the presence or absence of roentgenographic evidence of

pulmonary infiltration. The size of the roentgen opacities caused by the lymph nodes decreased even if the pneumonic process was progressive.

5. Confirming our previous observations during measles, pulmonary infiltrations, enlarged hilar shadows, increased intensity of the pulmonary markings and pleural changes were again found. These findings were frequently present in mild as well as in severe cases.

6. Shadows suggesting pulmonary infiltrations were found in 15 of 23 patients under 1 year of age.

7. The roentgenograms of the chest taken during measles showed pulmonary infiltration in only 4 of 17 patients receiving immune serum after exposure to measles. One gets the impression, therefore, that children receiving immune serum soon after exposure to measles are less likely to have pulmonary infiltrations.

8. Even in the patients who received serum and did not show pulmonary infiltrations, enlarged hilar shadows and increased intensity of the pulmonary markings were found.

9. Studies of roentgenograms, taken at necropsy, of children who died of measles give one a clearer conception of the pathologic process.

55 East Eighty-Sixth Street.

PNEUMONIA IN INFANTS

DUE TO BACILLUS MUCOSUS-CAPSULATUS

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AND

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Pneumonia in infants due to Bacillus mucosus-capsulatus is extremely rare. Comba,[1] in 1896, reported a case in an infant 6 days old. In his case autopsy revealed bronchopneumonia, and pure cultures of B. mucosus-capsulatus were obtained from the heart's blood and the exudate from the lungs. Mark Jampolis and his associates[2] have reported a series of twenty-two cases of infection of the intestinal tract in infants caused by B. mucosus-capsulatus. Friedländer's bacillus was recovered from the lungs in three of seven cases; that is, nearly 43 per cent of the cases that came to autopsy showed pneumonia due to Friedländer's bacillus. These authors stated that the observations made on gross examination of the lung were not typical of Friedländer's pneumonia, but suggested the explanation that the pneumonia was in a very early stage.

Pneumonia in adults caused by the Bacillus mucosus-capsulatus group of bacteria is not uncommon. It is estimated by Stitt[3] that this group causes about 5 per cent of all types of pneumonia. Weischselbaum[4] has shown that it is etiologically associated with pneumonia in about 7 to 8 per cent of all cases. Mackey[5] has shown that Bacillus influenzae, B. pertussis and B. mucosus-capsulatus occur in chronic nasal catarrh in children. The organism may be present also in the respiratory tract under normal conditions.[6] Since infants and children may be

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1. Comba: Jahresb. ü. d. Fortschr. d. path. Micro-Org. **12**:101, 1896.

2. Jampolis, Mark; Howell, Katherine M.; Calvin, Joseph K., and Leventhal, M. L.: Bacillus Mucosus Infection of the New-Born, Am. J. Dis. Child. **43**:70 (Jan.) 1923.

3. Stitt, E. R.: Practical Bacteriology, Blood Work, and Animal Parasitology, ed. 7, Philadelphia, P. Blakiston's Son & Co., 1923, p. 162.

4. Weichselbaum, quoted by Zinsser, Hans: Textbook of Bacteriology, ed. 6, New York, D. Appleton and Company, 1927, p. 614.

5. Mackey, L.: Nasal Infection in Children: Analysis of 85 Cases, Treated by Autogenous Vaccine, Brit. M. J. **1**:1004, 1927.

6. Todd, J. C., and Sanford, A. H.: Clinical Diagnosis by Laboratory Methods, ed. 7, Philadelphia, W. B. Saunders Company, 1931, p. 73.

exposed by carriers or by persons with catarrhal infections due to B. mucosus-capsulatus, it does not seem unreasonable to suppose that occasionally in an infant so exposed pneumonia due to that organism would develop.

This study of B. mucosus-capsulatus pneumonia in infants was begun after the bacteriologic examination at autopsy of the exudate from the lungs and trachea of a 7 month old girl revealed an encapsulated gram-negative bacillus of the Friedländer's group. On the day of her death her twin brother was admitted to the hospital with exactly the same clinical symptoms. A culture from the throat taken on admission showed a pure growth of an organism similar in every respect to the one found in the lungs of the infant who died. The twin brother, however, recovered after thirty-two days of hospitalization.

REPORT OF CASES

CASE 1.—*History.*—L. V., a girl, one of twins, aged 7 months, entered Meriden Hospital, on Jan. 29, 1932. She had developed normally, and at 5½ months weighed 15½ pounds (7,050 Gm.). Two illnesses were noted in the past history—a gastro-intestinal upset lasting two days at 4 months of age and an attack of croup of three day's duration three weeks prior to her last illness. On January 27, she became ill with coryza and cough. Vomiting and diarrhea developed the following day and continued for the next four days.

Examination.—On the patient's entrance to the hospital, examination showed an acutely ill infant with marked pallor of the skin, moderate dehydration and a mucopurulent discharge from the nose. The temperature was 103 F., the pulse rate, 120 and the respiratory rate, 32. Coarse râles were heard throughout both lungs, and there were dulness and suppression of breath sounds at both bases posteriorly. A diagnosis of bronchopneumonia was made. The diarrhea and vomiting ceased two days after the infant's admission, but the pulmonary difficulty increased. Cyanosis and marked dyspnea developed, and death occurred on February 3, six days after treatment in the hospital was begun and on the eighth day of the disease.

Laboratory Observations.—Examination of the blood on January 29 showed: hemoglobin, 75 per cent; erythrocytes, 5,420,000; leukocytes, 20,200; polymorphonuclear leukocytes, 48 per cent; lymphocytes, 50 per cent, and large mononuclears, 2 per cent. On the following day there were 5,120,000 erythrocytes, 17,000 leukocytes and 70 per cent hemoglobin.

Roentgen examination of the chest on the sixth day after the onset of the disease showed small patches of bronchopneumonia, particularly at the periphery of the pulmonary fields. There were also small round foci where the density of the lungs was decreased. These foci suggested cavities; they also occurred at the periphery of the lungs.

Autopsy.—Gross Observations: Autopsy revealed a girl, 65 cm. in length, well nourished and developed. The skin was pale, and the lips and membranes were bluish. There was a moderate amount of thick mucoid discharge from the nose. The pleural cavities showed a small amount of cloudy straw-colored fluid.

The heart weighed 35 Gm.; it appeared to be normal.

The cut surface of the lungs was wet, and bloody fluid exuded. Near the free margins of the lungs, there were many cavity-like foci the diameter of which

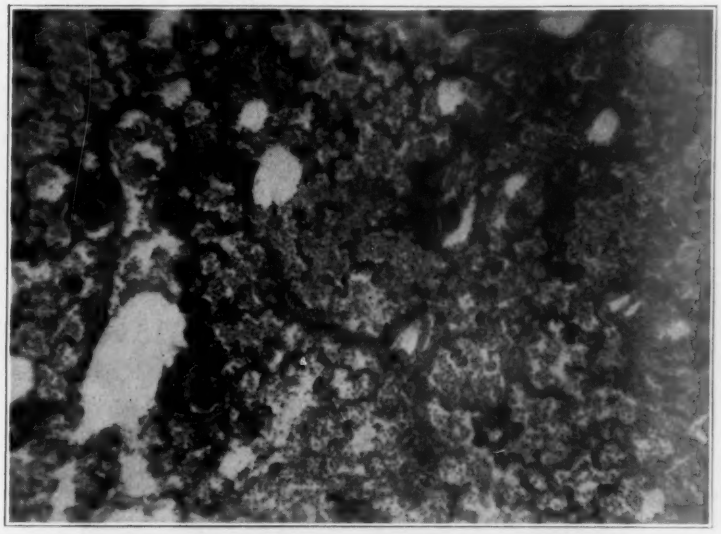

Fig. 1 (case 1).—A pneumonic focus from the left lung, showing the cellular type of exudate in the alveoli and bronchi. The lack of fibrin is evident; × 75.

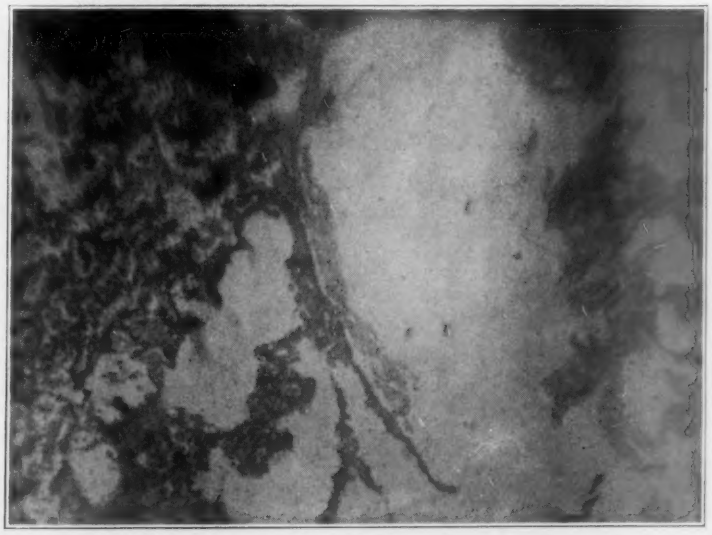

Fig. 2 (case 1).—A portion of a small cavity in the lung in case 1. The thin wall and the lack of any surrounding inflammatory reaction are apparent; × 75.

averaged about 1 cm. Many of these foci appeared to contain air, and in others the lung tissue was necrotic and could be picked out easily with forceps. These foci, also, contained a small amount of blood. Throughout both lungs there were red patches of consolidation. Considerable frothy, bloody fluid escaped from the cut surface of the alveoli, intervening between the consolidated patches. The bronchial mucosa was reddish, and in places was covered with a grayish, sticky exudate.

The liver weighed 170 Gm. and appeared normal.

The pancreas weighed 7 Gm. and appeared normal.

Examination of the gastro-intestinal tract showed that the mucosa of the small intestine was slightly reddish and smooth, and there was no sign of ulceration. The large intestine contained a small amount of greenish fecal material. The spleen weighed 8 Gm.; it appeared normal.

The suprarenals appeared normal.

The right kidney weighed 30 Gm.; the left weighed 35 Gm. The kidneys showed fetal lobulations.

Fig. 3 (case 1).—Roentgenogram of the chest taken on the sixth day of the disease, showing definite cavity formation (arrows) and a diffuse pneumonic involvement of the left lung.

The bladder, the uterus and the adnexa appeared normal.

The thymus weighed 13 Gm. and appeared normal. The bone marrow, the lymph nodes and the aorta appeared normal.

Microscopic Observations: Practically all the organs, with the exception of the lungs, appeared normal microscopically. The kidneys showed slight granular degeneration of the cells of the proximal convoluted tubules. The sinusoids of the lymph nodes were dilated and contained cells which appeared to be myelocytes. There was slight vacuolization of the cells of the suprarenal cortex.

The section of the lung showed many alveoli filled with polymorphonuclear leukocytes, a few red blood cells and a few mononuclear cells. In many alveoli there was a considerable amount of serous material and red blood cells. There was very little fibrin in the consolidated alveoli. In places, the alveolar walls appeared necrotic, and cavities were formed which contained a few red blood cells and eosin-staining mucoid-like material. There was no inflammatory reaction

around the cavities. In places the interalveolar capillaries were congested. The smaller bronchi were filled with polymorphonuclear leukocytes, mucoid material and desquamated bronchial mucosa. There was a slight peribronchial inflammatory reaction.

Bacteriologic Observations: Gram-Weigert stain and Gram's stain of sections of the lung showed many bacilli in the consolidated alveoli, in the cavities and in the bronchi. The bacilli were decolorized by Gram's method. Cultures were taken from the heart's blood, the spleen, both lungs and the trachea at autopsy. All cultures, except those of the heart's blood and the spleen, showed luxuriant growth in twenty-four hours. The cultures were transplanted in nutrient agar, plain agar, serum agar, Endo's mediums, and dextrose, lactose and saccharose fermentation tubes.

Each medium showed an abundant mucoid, sticky, stringy growth. The colonies were round and glistening. Dextrose and saccharose were fermented, with the production of acid and gas. Lactose was fermented slowly. Gram's stain and the capsule stain revealed a plump, encapsulated gram-negative bacillus. The bacillus was nonmotile and possessed no flagella. The cultures of the spleen and of the heart's blood remained sterile.

CASE 2.—*History.*—J. V., the twin brother of the first patient entered Meriden Hospital, on Feb. 3, 1932. There was nothing remarkable in the past history. The growth had been normal. On January 31, a cough and a nasal discharge developed. One day later, the patient began to vomit and had seven or eight loose green stools. These gastro-intestinal symptoms continued for five days.

Examination.—Examination on the patient's entrance into the hospital showed a well developed and nourished infant with marked pallor of the skin, slight dehydration and a mucopurulent discharge from the nose. The temperature was 101 F., the pulse rate, 140 and the respiratory rate, 30. Coarse moist râles were heard throughout both lungs. There were slight cyanosis of the lips and moderate dyspnea. Two days later dulness at the left base posteriorly was noted, and a diagnosis of bronchopneumonia was made. By February 8, however, the temperature had dropped to normal, and the râles had disappeared. Except for otitis media, which occurred on February 14, the convalescence was uneventful, and the patient was discharged on March 4, entirely well.

Laboratory Observations.—A blood count on admission showed 4,000,000 erythrocytes and 15,400 leukocytes and 70 per cent hemoglobin.

Roentgen examination of the chest on the day after admission, or the fifth days of illness, showed slight clouding of the pulmonary fields but no definite pneumonia.

Bacteriologic Data.—A culture taken from the throat the day after the child was admitted to the hospital showed a pure growth of a gram-negative encapsulated bacillus. This organism was similar in all respects to the organism isolated at autopsy from the trachea and lungs of the patient in case 1.

REVIEW OF IMPORTANT FINDINGS

In case 1 the infant, a girl, was admitted to the hospital on the third day of the disease and died on the eighth day. On admission the child was extremely pale, pasty and dehydrated in appearance, and had a cough and a mucopurulent nasal discharge. There were moderate dyspnea and cyanosis. The child was vomiting and had diarrhea when first seen.

These symptoms cleared up on the fifth day. The chest was full of moist râles. The temperature varied between 101 and 103 F. The pulse rate was about 130 and the respiratory rate was about 34 a minute. Roentgen examination of the chest on the sixth day of the illness showed a diffuse bronchopneumonia and many small round foci at the periphery of the lung fields that appeared to be cavities. Autopsy showed a patchy bronchopneumonia. The cut sections of the lung were red and wet. Many small cavities occurred, most of them at the periphery of the lungs. Some of the cavities contained a few red blood cells, gram-negative bacilli and mucoid-like material. The bronchi contained a sticky mucoid-like exudate in which there were many polymorphonuclear leukocytes, mucoid material and many gram-negative bacilli.

The patient in case 2, the twin brother of the patient in case 1, when admitted to the hospital on the fourth day of the disease, appeared to have clinical symptoms similar to those of his sister. There was a moderate cough, a mucopurulent nasal discharge and slight dyspnea. The chest showed moist râles. The child was extremely pale and had attacks of vomiting and diarrhea, with loose, greenish, watery stools, which cleared up by the eighth day of the disease. Culture of material from the throat revealed a pure growth of Bacillus mucosus-capsulatus. The temperature and pulse rate were not as high as in the former case, and the symptoms in general were not so marked. Roentgen examination of the chest did not show pneumonia. However, from the physical findings, a diagnosis of bronchopneumonia, probably of an influenzal type, was made. The symptoms improved gradually, and the child was discharged from the hospital on the thirty-second day, fully recovered. In view of the cases of infection of the intestinal tract due to Bacillus mucosus-capsulatus reported by Jampolis and his associates which were traced to infection by nursery maids who were carriers of the organism, a careful attempt was made to find a possible source of the infection. Repeated cultures were taken from the nose and throat of the father and mother, with negative results.

COMMENT

The bacteriologic observations are the important diagnostic feature in these cases. The organisms in the two cases were culturally and morphologically identical. The colonies were smooth and round. They grew luxuriously and were viscid and sticky. They fermented dextrose, lactose and saccharose, which corresponds to the S. strain described by Julianelle.[7] He stated that this group contained the virulent strains

7. Julianelle, L. A.: Variations in Cultures of Friedländer's Bacillus, J. Exper. Med. **47**:889, 1928; Immunological Relationships of Encapsulated and Capsule Free Strains of Encapsulatus Pneumonia (Friedländer's Bacillus), ibid. **44**:683, 1926.

of Bacillus mucosus-capsulatus, that the colonies are smooth, and that the group ferments dextrose, lactose, sucrose and maltose. Julianelle [8] has shown that there are thirty strains in the Bacillus mucosus-capsulatus group. The S. forms are very pathogenic for mice; one ten-millionth of a cubic centimeter of young culture will cause death within twenty-four to forty-eight hours. Webster [9] stated:

> Friedländer's bacilli infections in mice takes several clinical courses, depending on variations in host reaction and not depending on bacterial variation. The particular type of infection manifested is determined by the degree of resisting power displayed by the infected animals at the moment that the infection occurred and progressed.

It would seem that in respiratory infection with Friedländer's bacilli, the resistance of the host is an important factor in determining the type and extent of the infection. Stillman and Branch [10] stated that "Friedländer's bacilli often persist in the tracheal mucosa in experimental mice for three weeks after inhalation." The process of removal of the organism and infection is much slower than with the pneumococcus. This observation may explain the insidious onset of Bacillus mucosus-capsulatus pneumonia in infants.

Kornblum [11] and Collins and Kornblum [12] described clearly the roentgenologic aspects of pneumonia in adults caused by Bacillus mucosus-capsulatus. Kornblum [12] divided this type of pneumonia into four stages according to the roentgen findings: (1) the stage of bronchopneumonia, (2) the stage of pseudolobar pneumonia, (3) the stage of multiple abscess and cavity formation and (4) the healing stage or stage of fibrosis. In the first stage, the roentgenograms show a diffuse, patchy consolidation which involves the parenchyma and periphery of the lung. The second stage is similar to the first, except that there is more widespread involvement of the pulmonary parenchyma and the patches coalesce. The third stage shows the development of abscesses and cavities, and Kornblum stated that this is the most characteristic stage from a roentgenologic standpoint. Belk [13] has pointed out that the

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8. Julianelle, L. A.: Classification of Friedländer's Bacilli, J. Exper. Med. **44**:113, 1926.

9. Webster, L. T.: Mode of Spread of Friedländer's Bacillus Like Respiratory Infection of Mice, J. Exper. Med. **47**:889, 1928.

10. Stillman, E. G., and Branch, A.: Experimental Pneumonia in Mice Following Inhalation of Streptococcus Haemolyticus and of Friedländer's Bacillus, J. Exper. Med. **41**:623, 1925.

11. Kornblum, Karl: The Roentgen Ray Diagnosis of Pulmonary Infections with Friedlander's Bacillus, Am. J. Roentgenol. **19**:513, 1928.

12. Collins, L. H., and Kornblum, Karl: Chronic Pulmonary Infection due to the Friedländer Bacillus, Arch. Int. Med. **43**:351 (March) 1929.

13. Belk, W. P.: Pulmonary Infection by Friedländer's Bacillus. J. Infect. Dis. **38**:115 (Feb.) 1926.

absence of definite abscess walls is important from a roentgenologic standpoint, and that it is in this stage that death frequently occurs. In cases in which recovery takes place the fourth stage is one of fibrosis.

Belk [13] has reported cavity formation as early as the fourth day of the disease. In case 1 of this report, cavity formation was apparent on the sixth day of the disease, and the child died on the eighth day. There was practically no coalescing of the pneumonic patches, and the pneumonia remained lobular. Kornblum [11] pointed out the close resemblance between influenzal and Friedländer's pneumonia. Occasionally abscess formation occurs in influenzal pneumonia, but Kornblum stated that:

> Influenzal pneumonia differs from Friedländer's pneumonia in that it starts with intense congestion of the trachea and bronchi, and the roentgen ray changes first appear at the hilus and spread peripherally, while in Friedländer's pneumonia the first changes occur in the parenchyma and the periphery of the lung.

We believe that the manifestations of Friedländer's pneumonia in infants is slightly different from that of adults. If the infection is severe and the resistance of the child is low, the development of cavity formation occurs early, while the pneumonic process is still a diffuse consolidation of the lung. The pseudolobar stage did not occur in case 1 of our report, and death followed forty-eight hours after the appearance of cavities in the roentgenograms.

The original case of Friedländer's pneumonia in an infant, described by Comba, was lobular in type and in case 1 of this report the pneumonia was also lobular. It is probable that Bacillus mucosus-capsulatus pneumonia in infants is manifested by a diffuse lobular involvement, though Sisson and Walker [14] have found that in experimental Friedländer's pneumonia in cats, a lobar pneumonic process develops in 38.4 per cent. Belk [13] expressed the belief that the mucoid, sticky exudate found in the lungs is pathognomonic of Friedländer's infection. In case 1 of our report, no abscesses developed. There were numerous cavities without any definite wall or surrounding inflammatory reaction. The line of demarcation between consolidated lung tissue and intervening tissue was well marked. Branch and Stillman [15] stated in their paper on experimental pneumonia in mice following inhalation of Friedländer's bacillus that "there is an irregular patchy consolidation; the alveoli being filled with polymorphonuclear leucocytes and mucoid material. Fibrin is not abundant. Between the consolidated areas the

14. Sisson, W. R., and Walker, I. C.: Experimental Friedländer's Pneumonia, J. Exper. Med. **22**:747, 1915.

15. Branch, A., and Stillman, E. G.: The Pathology of the Experimental Pneumonias in Mice following Inhalation of Streptococcus Hemolyticus, of Friedländer's Bacillus and of Pneumococcus, J. Exper. Med. **41**:631, 1925.

alveoli appear emphysematous and the line of demarkation between the involved and healthy alveoli is sharp." Belk,[13] Kornblum[11] and Westermark[16] have pointed out the characteristic feature that the cavities have extremely thin walls, and also that the abscess cavities have very thin walls, or a definite abscess wall may be lacking. There is practically no inflammatory reaction surrounding the abscesses and cavities.

From a careful study of the clinical manifestations of the two cases of Bacillus mucosus-capsulatus pneumonia which are described in this paper, it is apparent that it would be extremely difficult to differentiate clinically between this type of pneumonia and influenzal pneumonia in infancy. In these cases there was extreme pallor, cyanosis, cough and a mucopurulent nasal discharge. There were vomiting and diarrhea early in the disease. The temperature and the leukocyte count were lower than in most types of pneumonia, except influenzal. The characteristic roentgenographic findings in Friedländer's pneumonia in adults, as described by Kornblum, did not occur in case 1 of this study.

The finding of Bacillus mucosus-capsulatus in pure culture in the throat and tracheal secretion of an infant with the aforementioned clinical symptoms strongly suggests that it is the etiologic agent. Therefore pneumonia developing in such a case would probably be due to Bacillus mucosus-capsulatus. The absolute proof, however, can be obtained only at autopsy. We believe that in case 1 of this report the evidence that Bacillus mucosus-capsulatus was the etiologic organism is unquestionable. In case 2, considering the fact that the infants were twins and that cultures from the throat revealed Friedländer's bacillus in pure growth, it seems probable that that organism was the etiologic agent.

SUMMARY

1. Two cases of lobular pneumonia in infancy caused by Bacillus mucosus-capsulatus have been reported; the twins were 7 months old, a girl and a boy. The girl contracted the disease first and died on the eighth day. The boy became ill two days after the onset of the illness in his sister but completely recovered after thirty-two days' hospitalization.

2. Bacteriologic examination of the throat and tracheal secretion is the most important procedure from a diagnostic standpoint. The extreme pallor of the skin and dehydration, the cough and mucopurulent nasal discharge in the two cases described in this report, together with

16. Westermark, N.: Ein Tuberkulose vortäuschender Fall von Friedländer's Pneumonie mit lange sich hinziehenden Verlauf, Acta radiol. **7**:626, 1926.

the vomiting and diarrhea which cleared up early in the disease, are suggestive from a standpoint of differential diagnosis.

3. Pneumonia in infants due to Bacillus mucosus-capsulatus may not terminate fatally. The pulmonary involvement is, perhaps, most often lobular, and the roentgen signs which are characteristic of the disease in adults may not occur in infants.

GROWTH AND RETENTIONS OF CALCIUM, PHOSPHORUS AND NITROGEN OF INFANTS FED EVAPORATED MILK

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Clinical studies [1] have shown that infants fed evaporated milk grow rapidly and apparently are equal physically to infants fed fresh milk. It has been demonstrated, however, that the calcium of certain forms of heat-treated milk is less available to the human infant than is that of quickly boiled fresh milk.[2] Because of this it was deemed advisable to study the actual retentions of infants fed evaporated milk.

For this purpose nine healthy male infants were studied for periods lasting from eighteen to forty-eight weeks. The evaporated milk used for the feedings was purchased in the open market, diluted with an equal quantity of 12 per cent corn syrup solution and acidified with lactic acid. This mixture was intended to be approximately equivalent to undiluted acidified fresh milk with the addition of 6 per cent corn syrup, which had been employed for similar observations on another group of infants during a preceding period.[3] In order to compare the utilization of evaporated milk with that of fresh milk, an attempt was made to keep the quantities of food and the additions to the diet the same, according to age, in the two groups. Certain changes were found necessary because it was observed that in some of the very young infants the

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This study was assisted by a grant from the Evaporated Milk Association.

From the Department of Pediatrics, College of Medicine, State University of Iowa.

1. Marriott, W. McK., and Schoenthal, L.: An Experimental Study of the Use of Unsweetened Evaporated Milk for the Preparation of Infant Feeding Formulas, Arch. Pediat. **46**:135, 1929. Brennemann, J.: The Curd and the Buffer in Infant Feeding, J. A. M. A. **92**:364 (Feb. 2) 1929.

2. Daniels, A. L., and Stearns, G.: The Effect of Heat Treatment of Milk Feedings on the Mineral Metabolism of Infants, J. Biol. Chem. **61**:225, 1924.

3. Nelson, M. V. K.: The Growth and Nitrogen Metabolism of Infants Receiving Undiluted Milk, Am. J. Dis. Child. **39**:701 (April) 1930; Calcium and Phosphorus Metabolism of Infants Receiving Undiluted Milk, ibid. **42**:1090 (Nov.) 1931.

evaporated milk in the concentration and amounts administered produced a slightly increased frequency of stool. This symptom had not been observed when undiluted acidified fresh milk was fed in the same quantities to the babies of the preceding study.[3] After the first few months no especial difficulties of this kind were encountered. After the age of 25 weeks three of the infants were given unacidified evaporated milk of the same concentration and with the same corn syrup addition.

In addition to the evaporated milk feedings, such daily dietary additions as are given as a routine in this clinic were administered. One teaspoonful of cod liver oil was given daily to infants of all ages, 1 ounce (28.35 cc.) of orange juice daily to infants under 4 months of age and 2 ounces (56.7 cc.) to older infants; an egg yolk was added to the daily diet at 4 months of age, sieved vegetables at 5 months and sieved fruits

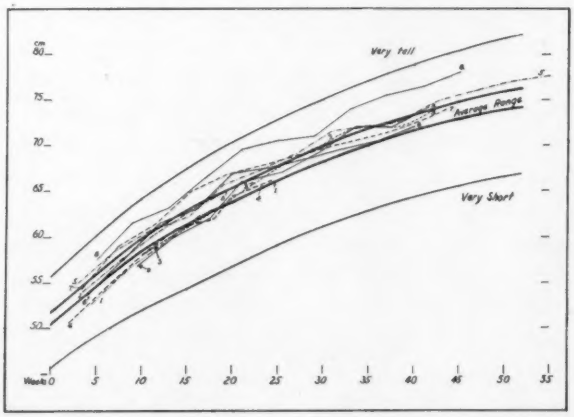

Fig. 1.—Length-age curves, compared with Kornfeld's standards: *1*, Myers; *2*, Specht; *3*, Menefee; *4*, Duncan; *5*, Lukehart; *6*, Awe; *7*, Wilson; *8*, Lukritz; *9*, Harrison.

at 6 months. In order to have the metabolism periods comparable, the same vegetable (tomato) and fruit (apricot) were given each infant during the periods of study.

CLINICAL FINDINGS

As has been stated, few of the younger infants could tolerate the evaporated milk feedings in the concentration in which they were first given, viz., diluted with equal parts of water. After about 4 months of age the evaporated milk in this same concentration produced no increased frequency of stool. At all ages regurgitation of small amounts of food was observed with somewhat greater frequency than when undiluted fresh milk is fed. At times the regurgitated material was in the form of large clots. The regurgitation and frequency of stool were inter-

preted as evidences of overfeeding. Since these studies were completed, an evaporated milk mixture of somewhat greater dilution has been fed without evidences of gastro-intestinal disturbance.

Despite these minor difficulties in feeding, the infants grew well both in length and in weight. The studies of growth were somewhat marred by the occurrence of a severe infection of the upper respiratory tract, which affected to a greater or lesser degree six of the infants. As the effect of the period of illness on growth differed considerably among the several infants, the growth curves of each infant, together with the pertinent data, are shown separately (figs. 4 to 12). The physical appearance of the infants at different periods during the study is shown in the accompanying illustrations (figs. 13 to 17).

The length-age and length-weight curves of the entire group are shown collectively in figures 1 and 2. Curves drawn from the data com-

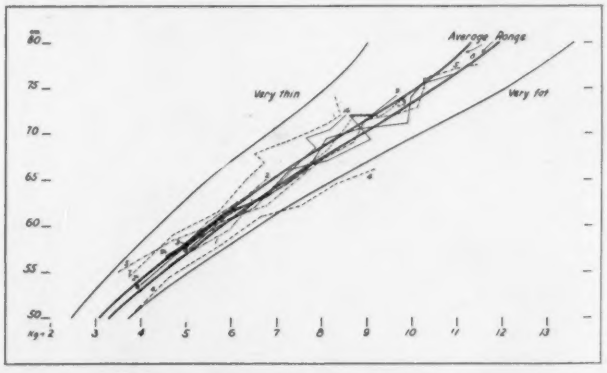

Fig. 2.—Length-weight curves, compared with Kornfeld's standards: *1*, Myers; *2*, Specht; *3*, Menefee; *4*, Duncan; *5*, Lukehart; *6*, Awe; *7*, Wilson; *8*, Lukritz; *9*, Harrison.

piled by Kornfeld [4] were used as standards, because his data involve the consideration of differences in body length at birth and differences in type of stature. It will be observed that, notwithstanding the period of illness, the rate of growth in length of each infant (chart 1) was somewhat greater than the standard rate. Kornfeld's standard rate, in turn, is greater than that of the "average Iowa male infant," [5] who, with a birth length of 52.4 cm., attains a length of 72.6 cm. at 10 months.

The growth in weight was, in general, such that the majority of infants were of average weight for their lengths (fig. 2). The

4. Kornfeld, W.: Zur Bewertung von Grösse und Gewicht bei Knaben und Mädchen aller Altesstufen, Ztschr. f. Kinderh. **48**:188, 1929.

5. University of Iowa Studies: Studies in Child Welfare: I. The Physical Growth of Children from Birth to Maturity, Iowa City, 1921, p. 53.

average weight of the group was thus as much above that of the "average Iowa infant" as was the average length. Two infants, Awe (no. 6) and Wilson (no. 7), were of the slender wiry type, as is shown in the illustrations, and one (Duncan, no. 4) became definitely obese. Figure 2 also shows clearly the effect of the infection on the rates of growth. Infants Wilson (no. 7) and Harrison (no. 9) lost weight, but continued to grow in length, while the growth in length of infants Lukehart (no. 5) and Lukritz (no. 8) was definitely slowed for a period, even though they continued to gain in weight. This period of slow

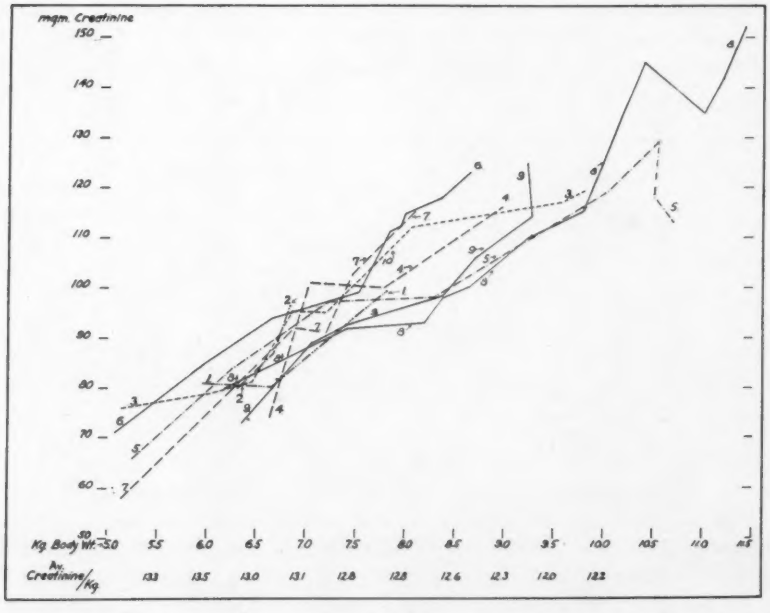

Fig. 3.—Creatinine-weight curves: *1*, Myers; *2*, Specht; *3*, Menefee; *4*, Duncan; *5*, Lukehart; *6*, Awe; *7*, Wilson; *8*, Lukritz; *9*, Harrison.

growth in length with increase in weight was followed by a period of more rapid growth in length without increase in weight.

Roentgenograms of the wrist were made at four week intervals for each infant. As in the preceding study,[3] the roentgenograms were interpreted differently by different roentgenologists, some confusion arising as to whether certain characteristics were indicative of beginning rickets or merely of rapid growth of bone. In no infant, however, was the evidence of rickets sufficiently definite to be designated even as "moderate." In some instances, as in the preceding study, "roentgenologic rickets" occurred in midsummer when the babies were outdoors a good deal of the time. In view of the rapidity of growth and the

rate of ossification of the carpals, it would appear that if rickets can be said to have been present, it was of no more than academic interest.

In the groups receiving evaporated milk, dentition was early, the infants averaging six teeth erupted at 40 weeks. The physical development, as indicated by sitting and other performance, was very good,

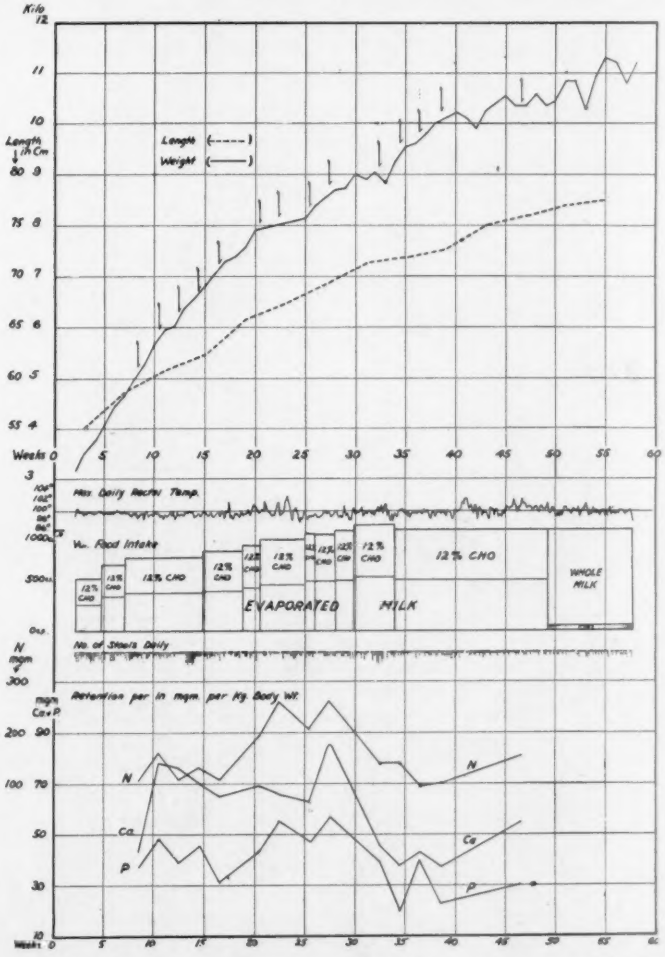

Fig. 4.—Baby Lukehart: Growth in weight and length and retention of nitrogen, calcium and phosphorus. In figures 4 to 12 the periods of metabolic study are indicated by arrows.

with the exception of two infants (Menefee and Harrison) whose development, both mental and physical, was somewhat slower than that of the remainder of the group. These two infants were also the most severely affected by the infection, and their period of recovery was much longer than that of any of the other babies.

METABOLIC TECHNIC

The ward routine followed for the metabolism studies was essentially that developed by Daniels and Stearns.[2] The customary daily records were kept, and in addition careful records were made of the physical progress of each infant. Roentgenograms of the wrists were obtained and anthropometric measurements made at four week intervals.

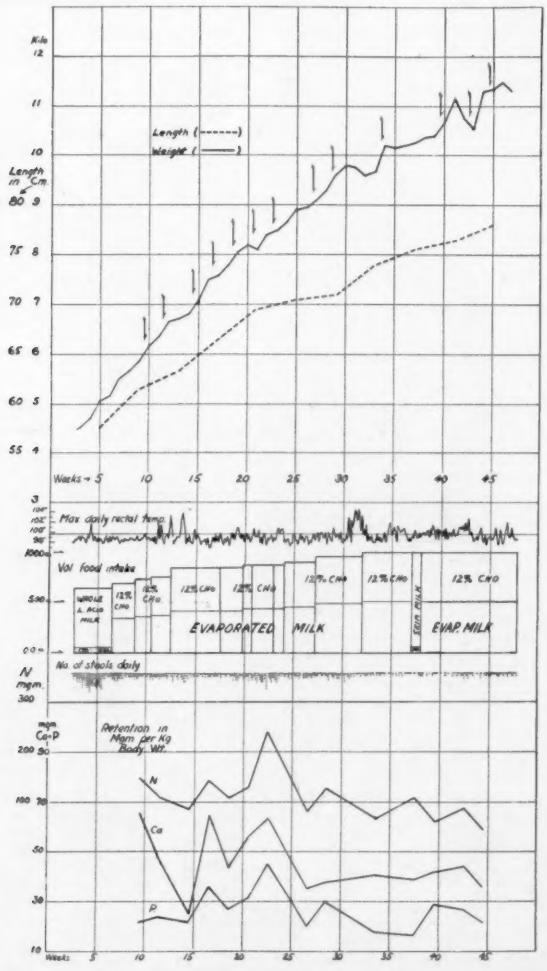

Fig. 5.—Baby Lukritz: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

The metabolism periods were usually of three days' duration. Studies of the same infant were made at intervals of not less than two weeks. Carmine was given at the beginning and end of the periods to mark off the fecal collection. The urine was analyzed in twenty-four hour specimens. The quantity of the feedings prepared for each day of the study period was such that an aliquot could be saved

for analysis. The total food and fecal collections for the period were digested with 20 per cent hydrochloric acid and prepared for analysis according to methods in use in this laboratory.[6] Nitrogen was determined by the Kjeldahl-Gunning method [7] and phosphorus by the method of Fiske and Subbarow.[8] Calcium was determined by McCrudden's [9] method, modified in the analysis of urine by so gaging the quantities of urine used that precipitation could be effected in a 50 cc. centrifuge tube. The precipitated calcium oxalate was washed twice with dilute ammonium hydroxide (20 cc. of the concentrated reagent per liter), the washing liquids separated by centrifugation, the precipitate dissolved in approxi-

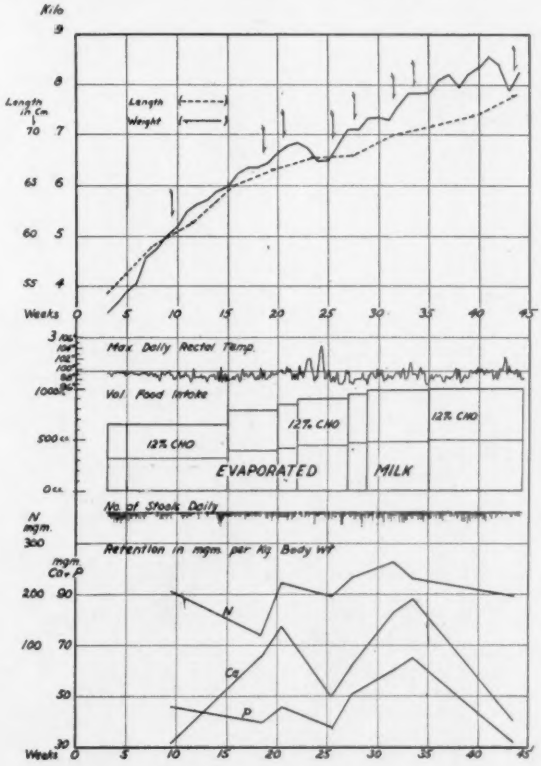

Fig. 6.—Baby Wilson: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

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6. Stearns, G.: A Rapid Method for the Preparation of Fecal Digests Suitable for Use in Nitrogen and Mineral Analyses, J. Lab. & Clin. Med. **14**:954, 1929.

7. Hawk, P. B., and Bergeim, O.: Practical Physiological Chemistry, Philadelphia, P. Blakiston's Son & Co., 1926.

8. Fiske, C. H., and Subbarow, Y.: The Colorimetric Determination of Phosphorus, J. Biol. Chem. **66**:375, 1925.

9. McCrudden, F.: The Determination of Calcium in the Presence of Magnesium and Phosphates: The Determination of Calcium in Urine, J. Biol. Chem. **10**:187, 1911-1912.

mately normal sulphuric acid and titrated with hundredth-normal potassium permanganate, following the technic usual in permanganate titrations.

Sources of Error.—In interpreting metabolic data obtained from a study of infants, certain factors must be kept in mind. The metabolism periods are necessarily of short duration, because it is difficult to keep an active infant comfortable for longer than three days under the restriction of activity necessary to insure the complete collection of urine and stool. This is especially true in hot weather.

It is not possible to collect urine from infants in periods of exactly twenty-four hours. The first urine voided after the infant is placed on the metabolism bed

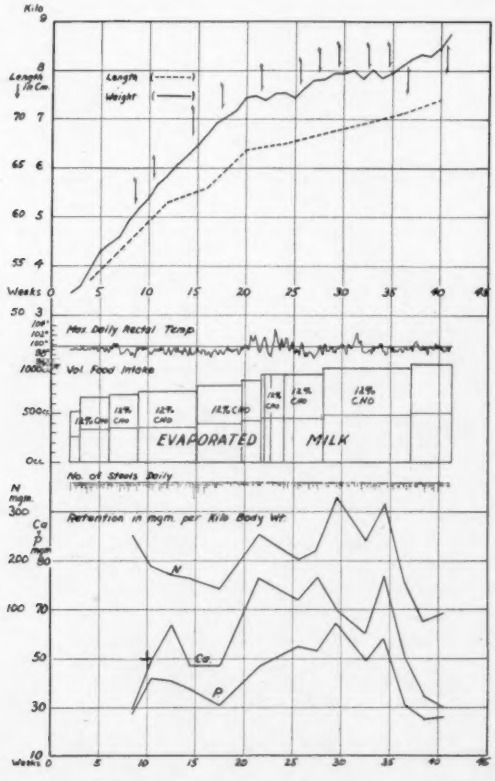

Fig. 7.—Baby Awe: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

is discarded, and the time of voiding determines the beginning of the period. At the close of the period the time of the last voiding is noted. The average of the three day period approximates the true excretion, but if the bladder is incompletely emptied during the first or last voidings of the period, an unavoidable error in collection results. Any error in the collection of urine will be reflected chiefly in the excretion of nitrogen, as from 80 to 90 per cent of the excreted nitrogen is found in the urine; the effect on the apparent excretion of phosphorus is also marked, for the urinary phosphorus is from 50 to 70 per cent of the total phosphorus excreted; the effect on the excretion of calcium, however, is negligible, as little calcium is excreted in the urine in infancy.

Another source of error is in the marking off of the fecal collection. Carmine given in small amounts with the feeding makes an efficient marker if there is no change in the type of stool during the period of collection. If the stools are loose, the carmine becomes dispersed through a greater quantity of stool than probably represents the feeding; if the feces are very firm, it is often difficult to effect a complete separation of the carmine and noncarmine portions. Errors in fecal collection affect chiefly the apparent retention of calcium and to a less degree the retention of phosphorus.

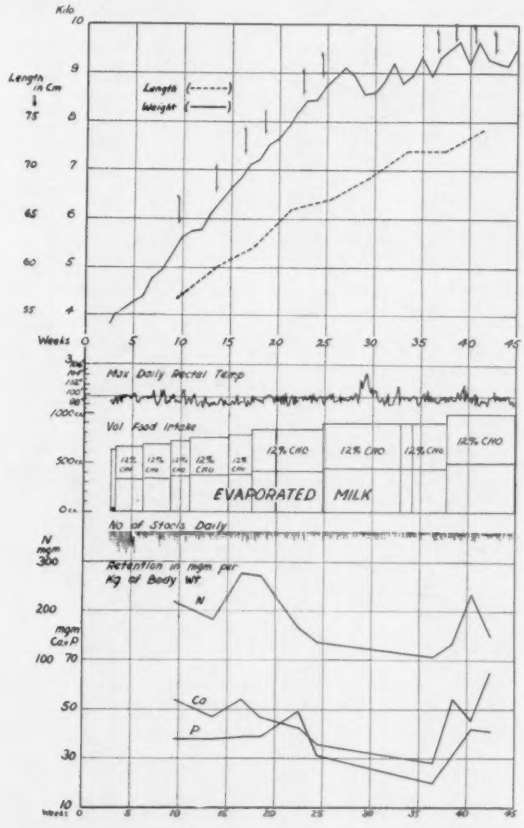

Fig. 8.—Baby Harrison: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

These unavoidable sources of error make single short periods of study of one infant of doubtful value. However, a series of studies of the same infant at different ages, or of several infants of the same age, according to the law of averages, should give a definite picture of the metabolic efficiency of the type of feeding used.

METABOLIC FINDINGS

A summary of the results of the study of retentions of nitrogen, calcium and phosphorus is given in table 1. Both the intakes and the retentions are calculated on a per kilogram per day basis. Infants who

TABLE 1.—*Intake and Retention of Nitrogen, Calcium and Phosphorus per Kilogram of Body Weight of Infants Fed Evaporated Milk*

Name Date of Birth	Date	Age, Wks.	Weight, Gm.	Nitrogen		Calcium		Inorganic Phosphorus		Retention Ratio Calcium/ Phosphorus
				Intake, Gm.	Retention, Gm.	Intake, Gm.	Retention, Gm.	Intake, Gm.	Retention, Gm.	
Myers.....	3/12/30	12	5,615	0.641	0.187	0.173	0.055	0.133	0.043	1.28
12/17/29	3/30/30	15	5,950	0.624	0.131	0.168	0.044	0.132	0.038	1.16
	4/16/30	17	6,660	0.593	0.121	0.161	0.059	0.125	0.039	1.51
	4/27/30	19	7,505	0.592	0.162	0.145	0.059	0.118	0.040	1.47
	6/17/30	27	7,850	0.583	0.089	0.159	0.057	0.126	0.038	1.50
Awe.....	4/15/30	9	5,090	0.673	0.252	0.183	0.029	0.144	0.028	1.04
2/16/30	4/29/30	11	5,670	0.652	0.187	0.172	0.050	0.134	0.042	1.19
	5/13/30	13	5,965	0.620	0.172	0.159	0.064	0.127	0.041	1.56
	5/27/30	15	6,360	0.583	0.161	0.153	0.047	0.120	0.037	1.27
	6/17/30	18	6,980	0.558	0.143	0.149	0.047	0.118	0.031	1.52
	7/14/30	22	7,515	0.589	0.252	0.140	0.083	0.116	0.047	1.75
	8/11/30	26	7,590	0.567	0.204	0.157	0.074	0.129	0.055	1.35
	8/25/30	28	7,840	0.558	0.221	0.153	0.083	0.120	0.053	1.56
	9/ 8/30	30	7,930	0.638	0.334	0.154	0.069	0.128	0.064	1.08
	9/29/30	33	7,930	0.638	0.240	0.153	0.060	0.127	0.049	1.22
	10/13/30	35	7,960	0.730	0.317	0.168	0.084	0.143	0.058	1.45
	10/29/30	37	8,190	0.588	0.159	0.145	0.051	0.114	0.031	1.65
	11/10/30	39	8,375	0.528	0.076	0.128	0.035	0.107	0.025	1.40
	11/24/30	41	8,635	0.555	0.093	0.142	0.030	0.117	0.026	1.15
Lukehart....	4/22/30	9	5,240	0.694	0.103	0.185	0.043	0.144	0.037	1.16
2/20/30	5/ 6/30	11	5,865	0.630	0.160	0.171	0.078	0.131	0.048	1.62
	5/20/30	13	6,280	0.588	0.109	0.158	0.076	0.120	0.039	1.95
	6/ 4/30	15	6,740	0.549	0.126	0.146	0.070	0.112	0.045	1.55
	6/17/30	17	7,225	0.542	0.108	0.151	0.065	0.103	0.031	2.08
	7/28/30	21	8,140	0.582	0.192	0.138	0.069	0.119	0.043	1.61
	8/11/30	23	8,270	0.580	0.260	0.136	0.066	0.118	0.053	1.25
	9/ 1/30	26	8,660	0.545	0.208	0.135	0.063	0.117	0.047	1.34
	9/15/30	28	8,950	0.580	0.260	0.145	0.086	0.119	0.057	1.51
	10/20/30	33	9,390	0.556	0.140	0.140	0.045	0.110	0.039	1.15
	11/ 3/30	35	9,760	0.502	0.140	0.095	0.038	0.082	0.020	1.90
	11/17/30	37	10,005	0.504	0.097	0.122	0.043	0.105	0.040	1.08
	12/29/30	39	10,557	0.468	0.100	0.120	0.037	0.097	0.023	1.60
	1/19/31	47	10,500	0.538	0.158	0.125	0.055	0.101	0.030	1.83
Wilson.....	4/26/30	10	5,150	0.668	0.206	0.189	0.032	0.147	0.046	0.70
2/17/30	6/30/30	19	6,570	0.556	0.120	0.163	0.066	0.135	0.040	1.65
	7/15/30	21	6,900	0.565	0.221	0.159	0.077	0.133	0.046	1.67
	8/18/30	26	7,065	0.665	0.197	0.166	0.050	0.135	0.038	1.32
	9/ 1/30	28	7,235	0.680	0.233	0.172	0.062	0.143	0.051	1.21
	9/29/30	32	7,485	0.675	0.265	0.173	0.083	0.143	0.060	1.38
	10/13/30	34	7,880	0.647	0.232	0.171	0.088	0.141	0.065	1.35
	11/25/30	44	8,565	0.475	0.197	0.119	0.040	0.100	0.032	1.25
Specht.....	6/24/30	14	6,015	0.630	0.185	0.165	0.036	0.126	0.033	1.09
3/17/30	7/ 7/30	16	6,300	0.600	0.130	0.159	0.056	0.122	0.029	1.93
	7/21/30	18	6,640	0.600	0.215	0.155	0.090	0.117	0.046	1.95
	8/11/30	21	6,830	0.670	0.268	0.162	0.057	0.134	0.043	1.33
Duncan.....	6/30/30	9	5,625	0.588	0.105	0.163	0.050	0.132	0.040	1.25
4/25/30	7/28/30	13	6,640	0.552	0.091	0.146	0.041	0.113	0.035	1.17
	8/25/30	17	7,060	0.540	0.080	0.142	0.036	0.111	0.025	1.44
	9/ 8/30	19	7,765	0.618	0.104	0.154	0.038	0.126	0.026	1.46
	9/22/30	21	8,330	0.566	0.121	0.141	0.039	0.117	0.027	1.44
	10/ 7/30	23	8,600	0.544	0.181	0.138	0.051	0.114	0.036	1.41
	10/20/30	25	8,980	0.558	0.141	0.132	0.061	0.116	0.042	1.45
	11/ 3/30	27	9,190	0.512	0.148	0.114	0.028	0.088	0.017	1.65
Lukritz.....	7/10/30	10	6,190	0.584	0.149	0.149	0.066	0.116	0.022	3.00
5/2/30	7/21/30	12	6,485	0.555	0.111	0.150	0.047	0.113	0.024	1.96
	8/18/30	15	7,430	0.535	0.088	0.141	0.025	0.115	0.022	1.14
	9/ 1/30	17	7,560	0.575	0.141	0.147	0.065	0.117	0.036	1.80
	9/15/30	19	8,190	0.524	0.111	0.128	0.044	0.107	0.027	1.63
	9/29/30	21	8,380	0.555	0.132	0.134	0.056	0.111	0.031	1.80
	10/13/30	23	8,620	0.610	0.240	0.132	0.064	0.118	0.045	1.42
	11/10/30*	27	9,250	0.540	0.081	0.123	0.033	0.102	0.020	1.65
	11/24/30	29	9,790	0.558	0.129	0.134	0.038	0.111	0.030	1.27
	12/29/30	34	10,113	0.472	0.070	0.115	0.031	0.095	0.018	1.72
	1/27/31	38	10,410	0.480	0.110	0.116	0.039	0.094	0.017	2.28
	2/ 9/31	40	11,015	0.485	0.061	0.125	0.042	0.100	0.029	1.45
	3/ 2/31	43	11,200	0.467	0.088	0.121	0.044	0.100	0.027	1.63
	3/16/31	45	11,400	0.441	0.051	0.114	0.037	0.094	0.022	1.68

* Beginning with this period unacidified milk was given.

TABLE 1.—*Intake and Retention of Nitrogen, Calcium and Phosphorus per Kilogram of Body Weight of Infants Fed Evaporated Milk—Continued*

Name Date of Birth	Date	Age, Wks.	Weight, Gm.	Nitrogen		Calcium		Inorganic Phosphorus		Retention Ratio Calcium/Phosphorus
				Intake, Gm.	Retention, Gm.	Intake, Gm.	Retention, Gm.	Intake, Gm.	Retention, Gm.	
Harrison.....	7/28/30	10	5,635	0.642	0.220	0.165	0.054	0.126	0.038	1.42
5/20/30	8/25/30	14	6,345	0.583	0.185	0.153	0.047	0.115	0.038	1.23
	9/15/30	17	7,090	0.674	0.278	0.141	0.054	0.107	0.039	1.39
	9/29/30	19	7,415	0.607	0.175	0.148	0.047	0.127	0.039	1.20
	10/27/30	23	8,380	0.563	0.166	0.139	0.043	0.114	0.049	0.88
	11/11/30*	25	8,705	0.548	0.139	0.126	0.036	0.108	0.031	1.16
	2/ 2/31	37	9,295	0.464	0.107	0.105	0.028	0.088	0.020	1.40
	2/16/31	39	9,675	0.508	0.136	0.131	0.054	0.103	0.031	1.74
	3/ 2/31	41	9,613	0.543	0.238	0.139	0.045	0.110	0.042	1.07
	3/16/31	43	9,237	0.464	0.150	0.116	0.065	0.095	0.041	1.58
Menefee.....	7/28/30	9	5,140	0.660	0.218	0.173	0.077	0.129	0.042	1.83
5/26/30	9/ 8/30	15	6,030	0.568	0.107	0.150	0.075	0.118	0.041	1.82
	9/22/30	17	6,430	0.608	0.183	0.157	0.080	0.119	0.048	1.67
	10/ 7/30	19	6,480	0.612	0.141	0.163	0.087	0.135	0.051	1.71
	10/20/30	22	7,265	0.660	0.198	0.154	0.043	0.134	0.035	1.23
	11/17/30*	26	8,050	0.650	0.126	0.151	0.063	0.127	0.036	1.75
	2/16/31	39	9,545	0.568	0.175	0.142	0.029	0.115	0.038	0.77
	3/ 9/31	42	9,775	0.478	0.141	0.124	0.028	0.095	0.029	0.97

* Beginning with this period unacidified milk was given.

were apt to regurgitate feedings were allowed to refuse food during the period of study, the amount of refusals being recognized in the calculations.

The retentions of each infant are shown graphically in the individual charts (figs. 4 to 12). Three of the infants were studied for fourteen or more periods each and four others for a total of eight periods each. Therefore, the general findings may be taken as representative of retentions obtained when evaporated milk is fed in the quantities and with the additions used in this study. As is to be expected, the quantity of retention observed during the different periods is somewhat variable, and these variations are more marked in the case of certain infants than in others. In general, however, a definite parallelism can be observed in the retentions of the three elements studied. Because of the differences in the paths of excretion of these elements, such a parallelism can hardly be fortuitous, but probably represents definite trends in the ability of the infant to retain food elements. For example, the highest retentions were observed usually when the children were between 20 and 30 weeks of age. Again, after the period of illness, a marked drop in the retention of all three of the elements studied was observed with every infant. The retentions remained low for a considerable period after recovery, a second rise being noted with the two children who were studied for the longest period after illness.

RETENTION OF NITROGEN AND MUSCULAR GROWTH

The retentions of nitrogen (table 1 and figs. 4 to 12) were surprisingly high, especially between the ages of 20 and 35 weeks. The gains in

weight also indicate good growth of nitrogenous tissues, for, with the exception of baby Duncan, none of the infants was obese and two (Awe and Wilson) were of the slender wiry type (see photographs). The activity of the infants was also indicative of good muscular development.

The excretion of urinary creatinine is considered an index of the total quantity of muscular tissue of the body. In figure 3 the urinary

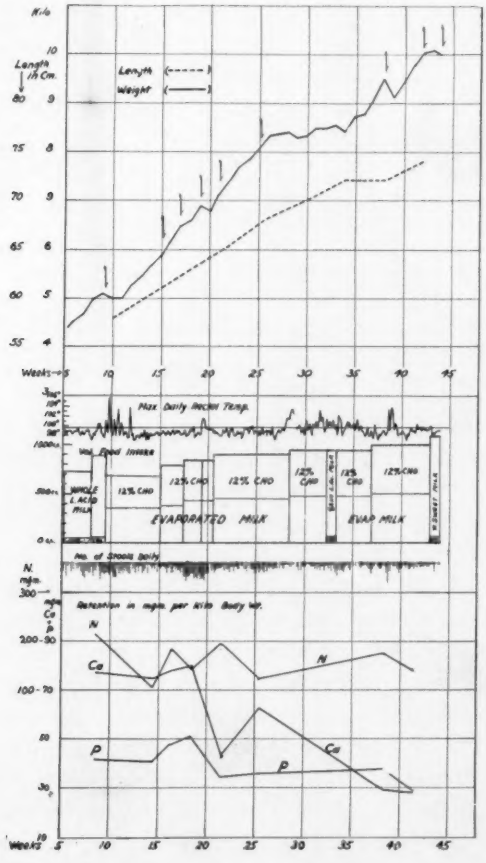

Fig. 9.—Baby Menefee: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

creatinine is plotted against the weight of the infant. Minor fluctuations in excretion are to be expected. In general, the excretions of creatinine for the group as a whole are consistent and indicate a steady growth of the musculature throughout the entire period of study. The creatinine coefficients (creatinine nitrogen per kilogram of body weight) varied from 4.1 to 5.4, values equal to or greater than those observed by

other investigators studying well developed infants.[10] The average excretion of creatinine per kilogram decreased slowly from 13.3 mg. at 5.5 Kg. to 12.2 mg. at 10.0 Kg., showing that the quantity of the musculature of the group was increasing at a rate only slightly lower than the rate of growth of the body as a whole. According to Scammon,[11] the muscles do not grow as fast as the remainder of the body during infancy. The high creatinine coefficients observed in the group of infants given evaporated milk, together with the relatively constant rate

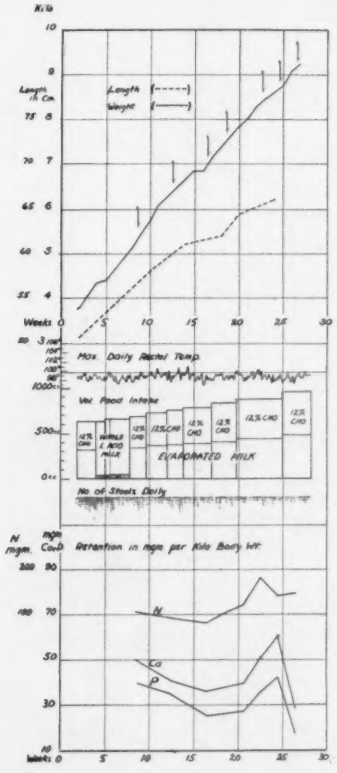

Fig. 10.—Baby Duncan: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

of excretion throughout the period of study, indicate that the growth of muscular tissue was excellent and was entirely commensurate with the rate of growth of the body as a whole.

10. Hunter, A.: Creatine and Creatinine, New York, Longmans, Green & Co., 1928. Daniels, A. L., and Hejinian, L. M.: Growth of Infants from the Standpoint of Physical Measurements and of Nitrogen Metabolism: II. Creatine, Am. J. Dis. Child. **38**:499 (Sept.) 1929.

11. Scammon, R. E.: A Summary of the Anatomy of the Infant and Child, in Abt: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, chap. 3, p. 295.

RETENTION OF CALCIUM AND DEVELOPMENT OF BONE

The retention of calcium by the different infants and by the same infants at different periods showed considerable variation, but in general was high, as is shown in the individual charts (figs. 4 to 12). In those periods in which there were definite symptoms of overfeeding (increased frequency of stools) the retention of calcium was decreased. Lowered retentions were observed also after apparent recovery from the

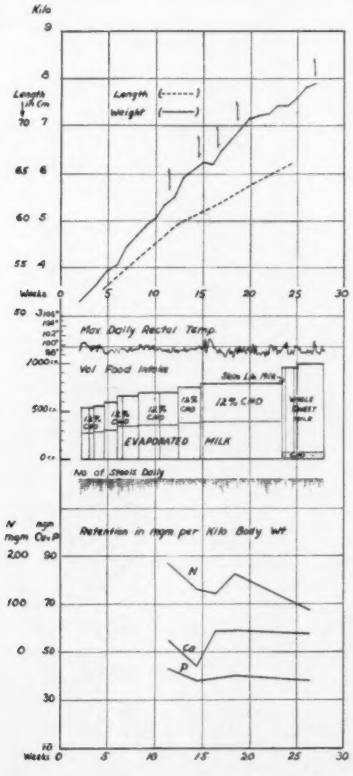

Fig. 11.—Baby Myers: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

infection. During the latter period the infants suffered from lack of appetite.

The serum of each infant was analyzed for calcium and inorganic phosphorus at intervals during the study. The values for calcium ranged between 10.2 and 12.1 mg. per hundred cubic centimeters. The inorganic phosphorus values were higher than is often reported as normal, varying (with one exception) from 5.2 to 7.3 mg. per hundred cubic centimeters. These high phosphate values have been observed for several successive years in this clinic in well infants given a high intake

of calcium and phosphorus, together with cod liver oil. One phosphorus determination on one infant was low, viz., 4.3 mg. The next value obtained from this infant one month later was 6.8 mg. These data have been interpreted as chemical evidence of the absence of rickets.

A study of the rate of ossification of the carpal areas of these infants was undertaken by Miss Idell Pyle of the Child Welfare Research Station of this university. The average rate of ossification for the group of babies given evaporated milk was definitely above the average for Iowa infants. None of the infants was below the Iowa average; the two

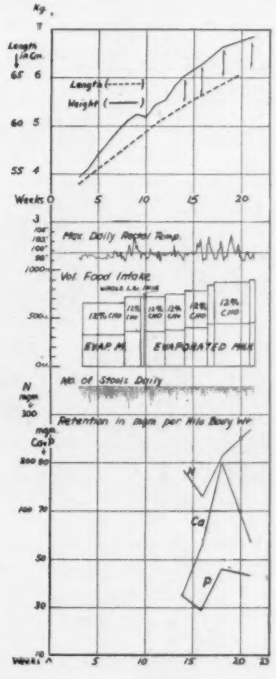

Fig. 12.—Baby Specht: Growth in weight and length and retention of nitrogen, calcium and phosphorus.

largest infants (Lukehart and Lukritz) were usually within the Iowa average range, somtimes having an increased rate, and the others of the group were well above the Iowa average in the rate of ossification of carpal areas.

An increased rate of deposition of minerals in bone and an increased rate of skeletal growth of the infants are indicated by the high mineral retentions, early carpal ossification, rapid growth in length and the entire absence of clinical or chemical evidence of rickets. The same factors offer abundant evidence that the amount of calcium retained from evaporated milk feedings, when these are accompanied by the dietary

additions used with these infants, is amply sufficient to provide for excellent growth and development of bone. This finding is perhaps of particular interest in view of the poor retentions of calcium observed in infants fed pasteurized milk [2] and is in line with the observations of Willard and Blunt [12] and of Kramer, Latzke and Shaw.[13] Willard and Blunt found that evaporated milk is slightly superior to pasteurized milk as a source of calcium, phosphorus and nitrogen for children. Kramer, Latzke and Shaw observed that evaporated milk is as well utilized by women as is fresh milk, but that pasteurized milk gives less favorable calcium balances than evaporated or fresh milk.

RETENTION OF PHOSPHORUS

Phosphorus is utilized both by soft tissues and in bone. Consequently the amount of phosphorus retained should be sufficient to com-

Fig. 13.—Photograph taken on Oct. 26, 1930. From left to right the babies are: Lukritz, 25 weeks old; Awe, 36 weeks old; Lukehart, 35 weeks old, and Wilson, 36 weeks old.

bine with both the nitrogen and the calcium retained by the infant. The ratio of nitrogen to phosphorus in the body of an infant is given by Schabad [14] as 16.7 : 1. The ratio of calcium to phosphorus in bone is approximately 2 : 1 (1.98 : 1 to 2.2 : 1).[15] The actual retention of phosphorus presumably should approximate rather closely the sum of the

12. Willard, A. C., and Blunt, K.: A Comparison of Evaporated with Pasteurized Milk as a Source of Calcium, Phosphorus, and Nitrogen, J. Biol. Chem. **75**:251, 1927.

13. Kramer, M. M.; Latzke, E., and Shaw, M. M.: A Comparison of Raw, Pasteurized, Evaporated and Dried Milks as Sources of Calcium and Phosphorus for the Human Subject, J. Biol. Chem. **79**:283, 1928.

14. Schabad, J. A.: Zur Bedeutung des Kalkes in der Pathologie der Rachitis, Arch. f. Kinderh. **53**:380, 1910.

15. Schabad.[14] Howland, J.; Marriott, W. McK., and Kramer, B.: Studies upon the Inorganic Composition of Bone, J. Biol. Chem. **68**:721, 1926.

amounts of the elements needed for the building of bone and of nitrogenous tissue. The retentions of phosphorus calculated for these infants are quite consistent with the values actually observed.

RETENTIONS FROM EVAPORATED MILK AND FRESH MILK

In table 2 are given the summarized results of the present study, together with those of the group given acidified fresh milk in the preceding study.[3] The quantities of food in the two groups were approximately equivalent. The retentions of both groups were large. The retention of calcium was larger in the infants under 15 weeks of age fed

TABLE 2.—*Comparison of the Average Retention of Nitrogen, Calcium and Phosphorus per Kilogram of Body Weight of Infants Fed Fresh Acidified Milk and Those Fed Equivalent Quantities of Evaporated Milk*

Type of Feeding	Age, Weeks	Number Infants Studied	Average Weight, Kg.	Retention per Kg. per Day			Calcium/ Phosphorus
				Nitrogen, Gm.	Calcium, Gm.	Phosphorus, Gm.	
Fresh whole milk (acidified) (Nelson[3])	5-10*	5	5.18	0.211	0.072	0.042	1.7
	10-15	16	6.26	0.185	0.062	0.034	1.8
	15-20	15	7.26	0.170	0.061	0.034	1.8
	20-25	9	8.07	0.146	0.062	0.033	1.9
	25-30	8	8.39	0.147	0.068	0.035	1.9
	30-35	6	9.09	0.154	0.059	0.036	1.6
	35-40	5	9.59	0.144	0.053	0.032	1.7
	40-50	7	10.49	0.123	0.044	0.027	1.6
Evaporated milk (acidified) (authors' data)	5-10	7	5.44	0.179	0.050	0.036	1.4
	10-15	13	6.24	0.143	0.054	0.038	1.5
	15-20	15	7.06	0.147	0.060	0.036	1.7
	20-25	13	8.07	0.193	0.057	0.041	1.4
	25-30	12	8.28	0.186	0.059	0.042	1.4
	30-35	8	8.64	0.201	0.061	0.044	1.4
	35-40	9	9.65	0.113	0.040	0.028	1.4
	40-50	8	9.86	0.139	0.043	0.031	1.4

* In recalculating the age of these infants, 30 days were used to represent 1 month.

fresh milk (quickly boiled but not pasteurized) than in the group fed evaporated milk. After 15 weeks of age, the retentions of calcium were quite comparable in the two groups. Retentions of nitrogen were larger below 20 weeks of age in the group fed fresh milk and between 20 and 35 weeks in the group fed evaporated milk. The lower nitrogen retentions in the early weeks were due apparently to gastro-intestinal disturbances incident to overfeeding and not to any properties inherent in evaporated milk.

The retentions of phosphorus in both groups apparently were controlled by the retention of nitrogen and calcium. A constant difference, however, is observed in the ratios of calcium to phosphorus retained by the two groups. The ratios of the groups given fresh milk were consistently slightly higher than those of the group fed evaporated milk. The differences appear to be due to the relative quantities of nitrogen and calcium retained. In the fresh milk group, the high retention of nitrogen during the first two months was accompanied by a high reten-

tion of calcium. In the evaporated milk group, the sharp increase in the retention of nitrogen observed between the twentieth and thirty-fifth weeks was not accompanied by any marked increase in retention of calcium.

Fig. 14.—Photograph taken on Oct. 26, 1930. From left to right the babies are: Menefee, 22 weeks old; Harrison, 23 weeks old; Simons, 27 weeks old, and Duncan, 26 weeks old. The study of Baby Simons was concluded because of a spasticity which became increasingly evident. During the periods when he was taking food well, his retentions were very large. The data have not been included because the results for the periods when he could be studied were not representative of his average retentions, but probably were more nearly maximal retentions.

Fig. 15.—Photograph taken on Nov. 30, 1930. From left to right the babies are: Lukritz, 30 weeks old; Awe, 41 weeks old; Wilson, 41 weeks old, and Lukehart, 40 weeks old.

The possible significance of the calcium-phosphorus retention ratio as a criterion of comparative rates of growth of bony and soft tissues has been discussed in a previous publication from this laboratory.[16]

16. Stearns, G.: The Significance of the Retention Ratio of Calcium: Phosphorus in Infants and in Children, Am. J. Dis. Child. **42**:749 (Oct.) 1931.

Fig. 16.—Photograph taken on Dec. 28, 1930. From left to right the babies are: Lukritz, 34 weeks old; Menefee, 31 weeks old; Lukehart, 44 weeks old, and Harrison, 32 weeks old.

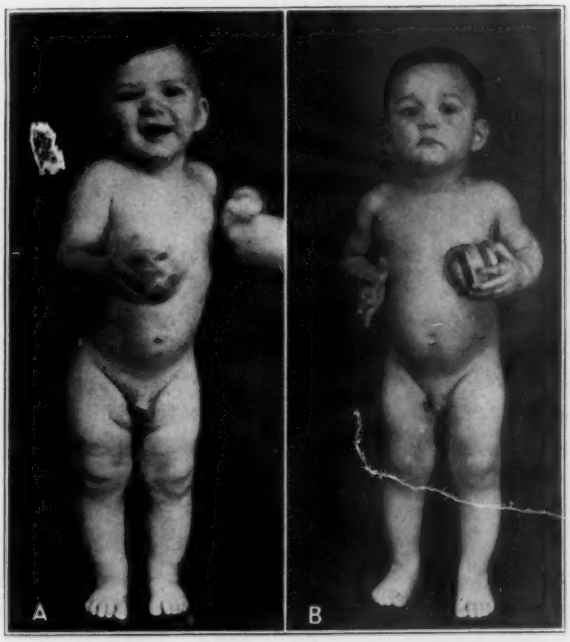

Fig. 17.—*A*, Baby Lukritz at 45 weeks. *B*, Baby Lukehart at 55 weeks.

From theoretical considerations, a retention ratio of at least 1.5 : 1 is considered desirable in infancy, a preferable ratio being one between 1.5 : 1 and 2 : 1. Despite the fact that the retention ratios observed in the group fed evaporated milk were slightly lower than those of the previous group, these infants offered no clinical evidence of either a relative or an absolute deficiency in the retention of calcium.

COMMENT

The concentration of the feeding used in this study (one part of evaporated milk to one part of diluent) was chosen in part because certain clinicians had recommended it as a suitable and successful food, and in part because the resulting mixture approached in composition the formula prepared from fresh milk used as the basis for a former study. Moderate symptoms of overfeeding were common during the early weeks in the group fed evaporated milk, whereas no such symptoms developed in the babies fed fresh milk. A logical explanation for this difference is that the evaporated milk mixture contained more food and consequently approached the limit of tolerance of the infants more closely than did the fresh milk mixture. The fresh milk used was from a Holstein herd and therefore contained less fat than the evaporated milk mixture. Another factor, perhaps of less importance, is that corn syrup was added as a diluent to the fresh milk, whereas it was added to the diluent for the evaporated milk. The brand of evaporated milk used for most of the study was one which had been reduced to approximately half, or only a little less, of its original volume. Later observations have demonstrated that evaporated milk mixtures of slightly greater dilution are better tolerated by young infants.

The retentions of the elements studied were high, as they were also in the former study in which fresh milk was fed. High retentions have been noted by other observers in infants given milk mixtures more concentrated than human milk, and in general the retentions have been found to be more or less in proportion to the intake. High mineral retentions in particular have been the basis for some comment in the literature, with the idea expressed by certain authors that these may result in a "super-mineralization" and with the inference that such retentions may not be desirable or may even be deleterious. It is our belief that the high retentions of calcium and phosphorus observed in this study do not represent an undesirable excess, but that they are a part of good growth and constitute a factor of safety. Further comment on this subject is reserved for a separate communication.

SUMMARY

Nine healthy male infants were fed a mixture of equal parts of evaporated milk and 12 per cent corn syrup, acidified with lactic acid.

Orange juice, cod liver oil, egg yolk, fruits and vegetables were fed in addition at suitable ages. The infants were observed for periods of from eighteen to forty-eight weeks.

The growth in length and weight was excellent and exceeded standard rates of growth and the rate of the average male infant of Iowa.

Except in the early weeks, when clinical evidences of moderate overfeeding were present, the retentions of nitrogen, calcium and phosphorus were high and were approximately the same as those which had been obtained when undiluted acidified fresh milk was fed to a group previously studied.

The high retention of nitrogen, high excretion of creatinine and good physical progress are considered evidences of good muscular growth.

The high retentions of calcium and phosphorus, early carpal ossification, rapid growth in body length and the absence of clinical or chemical evidence of rickets are considered evidences of good bone growth.

From the data presented, it is concluded that evaporated milk, when used with the dietary supplements given in this investigation, is a good food for infants. From the standpoint of permitting good growth and high retentions of nitrogen, calcium and phosphorus, evaporated milk compares favorably with fresh milk given with the same dietary supplements.

THUMB SUCKING APPARATUS

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The accompanying illustration shows an apparatus for the control of thumb sucking in infants, the mechanism of which is as follows:

This splint is made of aluminum wire, 3/16 inch (0.48 cm.) in diameter, according to measurements of the infant's arm, the circumference at the axilla and at the

Thumb sucking apparatus

wrist and the length of the arm from the axilla to the wrist. The large loop fits the arm at the axilla. The distal end is fastened around the wrist with a ball and socket chain, such as is used on electric pull chains. The apparatus is cool and durable and can be easily sterilized. The ball and socket chain cannot be easily unfastened by an infant. This is a modification of an apparatus for the control of thumb sucking described in the AMERICAN JOURNAL OF DISEASES OF CHILDREN [1] some time ago.

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1. Anderson, W. W.: Thumb Sucking Apparatus, Am. J. Dis. Child. **39**:70 (Jan.) 1930.

DIETARY CONTROL AND ETIOLOGY OF DENTAL CARIES

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Experiments with animals have shown that diets deficient in vitamin C or D or unbalanced in their calcium and phosphorus content often lead to structural defects (hypoplasia) of bones and teeth.[1] Histologic examination of carious teeth of children [2] revealed a high incidence of such defects, and it was concluded that hypoplasia predisposes to dental caries. Mellanby [3] stated that diet, by improving structure, might lead to an arrest of caries in the human being, and observations on children and adults showed that it was often possible to arrest caries with carefully controlled diets. Other investigators [4] found that a well balanced diet seemed to decrease the incidence of caries both in animals and in

From the Department of Pediatrics, Cornell University Medical College, the New York Nursery and Child's Hospital and the Heckscher Foundation Dental Clinics.

1. (*a*) McCollum, E. V.; Simmons, N.; Kinney, E. M., and Grieves, C. J.: The Relation of Nutrition to Tooth Development and Tooth Preservation: I. A Preliminary Study of Gross Maxillary and Dental Defects in 220 Rats on Defective and Deficient Diets, Bull. Johns Hopkins Hosp. **33**:202, 1922. (*b*) Marshall, J. A.: Changes in Tooth Structure Resulting from Deficient Diets, J. A. M. A. **81**:665 (Jan. 20) 1923. (*c*) Zilva, S. S., and Wells, F. M.: Changes in the Teeth of the Guinea-Pig Produced by a Scorbutic Diet, Proc. Roy. Soc. Med. **90**:505, 1917. (*d*) Howe, P. R.: Decalcification of Teeth and Bones, and Regeneration of Bone through Diet, J. A. M. A. **79**:1565 (Nov. 4) 1922. (*e*) Mellanby, M.: The Influence of Diet on the Structure of Teeth, Physiol. Rev. **8**:545, 1928. (*f*) Walkhoff, O.: Die Vitamine in ihrer Bedeutung für die Entwicklung, Struktur und Widerstandsfähigheit der Zähne gegen Erkrankungen, Berlin, H. Meusser, 1929, p. 32. (*g*) Toverud, K. U., and Toverud, G.: Studies on the Mineral Metabolism During Pregnancy and Lactation and Its Bearing on the Disposition to Rickets and Dental Caries, Acta paediat. (supp. 2) **12**:1, 1931.

2. Mellanby, M.: The Structure of Human Teeth, Brit. Dent. J. **48**:737, 1927.

3. Mellanby,[1e] p. 570.

4. (*a*) Boyd, J.; Drain, C. L., and Nelson, M. V.: Dietary Control of Dental Caries, Am. J. Dis. Child. **38**:721 (Oct.) 1929. (*b*) Bunting, R. W.; Hadley, F. P.; Joy, P., and Hard, D. Y.: The Problem of Dental Caries, Am. J. Dis. Child. **40**:536 (Sept.) 1930. (*c*) Hanke, M. T.: Relation of Diet to General Health and Particularly to Inflammation of Oral Tissues and Dental Caries, J. Am. Dent. A. **17**:957, 1930. (*d*) Hawkins, H. F.: Dental Decay: Means for Its Control, J. Am. Dent. A. **16**:781, 1929.

human beings. Hanke and Bunting,[5] in recently reported studies, have considered this subject in detail.

In view of these observations, it seemed important to determine which constituents of the diet, if any, played either an indirect rôle in the improvement of structure or a direct rôle in the prevention and arrest of caries. To achieve this purpose, foodstuffs containing an abundance of calcium and phosphorus, vitamin C and vitamin D were added to balanced and unbalanced diets,[6] and the influence of these additions on the incidence of caries was studied. At the same time, it was hoped that the effects of these factors on dental caries might be reflected in changes of inorganic phosphorus and calcium of the serum.

The influence of other systemic factors, such as age and heredity, as well as of local factors, such as oral hygiene, bacterial flora of the mouth and hypoplasia, was also considered.

METHODS OF PROCEDURE

This investigation was begun in the late fall of 1929. Three hundred and nineteen children who were patients in the dental department of the Heckscher Foundation were studied. Most of them belonged to the lower economic strata of the population. Their ages ranged from 4 to 16 years at the beginning of the study. Forty-eight per cent were boys; 52 per cent, girls. Ninety per cent were American-born, and among the 8 per cent who were foreign-born, Puerto Ricans predominated.

A complete history was taken when patients were first seen, the accuracy of which was checked in subsequent visits. In most instances, two or three complete physical examinations were made at intervals of six months, and the heights and weights of the patients were recorded during the period of observation, which averaged about thirteen months.

Dental Charting.—Deciduous and permanent teeth, the total number of teeth, the number of cavities, potential cavities, pits and slight pits, fillings and oral hygiene were noted on special charts.[7] All fully erupted teeth were counted; roots were not included. Examinations were checked by roentgenograms, and cavities which had not been found on examination but were visible roentgenographically were recorded. All cavities which had been filled within three months prior to our first examination were counted as original cavities.

The children were divided into four groups, according to the number of cavities and fillings present at the beginning of this study: (*A*) no cavities or fillings

5. Hanke, M. T.: The Rôle of Diet in the Cause, Prevention and Cure of Dental Diseases, J. Nutrition **3**:433, 1931. Bunting, R. W.: Review of Recent Researches on Dental Caries, J. Am. Dent. A. **18**:785, 1931.

6. A diet was considered unbalanced when it was grossly deficient or lacking in one or two of the following foodstuffs: milk, fruit, vegetables and egg, meat or fish.

7. Cavities were counted according to the surfaces which they involved; for example, one cavity which included mesial, occlusal and distal surfaces was counted as three cavities.

(1 child); (*B*) from 1 to 8 cavities or fillings (92 children); (*C*) from 9 to 16 cavities or fillings (124 children), and (*D*) over 16 cavities or fillings (102 children). The average age of these children was 11.4, 10.7 and 11.5 years for groups B, C and D, respectively.

Furthermore, the children were divided into three groups, according to the number of cavities which developed during observation: (1) no cavities; (2) 1 cavity, and (3) 2 or more cavities.

Arrest or progression of carious lesions was followed by means of roentgenograms and diagrams and charted accordingly; i. e., if a small cavity was present originally and it became definitely larger, it was recorded as an additional cavity. Dental therapy was adequate in all instances, and an effort was made to complete the treatment as quickly as possible. In addition, prophylactic treatment was given by the hygienist at regular intervals after the condition of the mouth had been recorded.

Dental Classification of Parents.—The parents of the children were divided into four groups according to the extent of dental destruction present: (1) no caries; (2) moderate caries; (3) rampant caries, and (4) an edentulous mouth. This was of necessity a superficial classification, since circumstances did not always permit a thorough examination.

Oral Hygiene.—At each examination, the hygienic condition of the mouths of the children was recorded and graded as follows: poor (abundant plaque); moderate plaque; slight plaque, and good (no plaque).

Bacteriology of Oral Cavity.—The bacterial flora was examined before therapy was instituted. In at least one half of the cases the examination was repeated within a short time, and the results of both tests were considered. This study comprised a group of 109 children, 55 of whom were not included in the original number.

Cultures were taken from the saliva and the surface of the teeth and from two cavities when caries was present. The swab or explorer was immersed into dextrose broth of p_H 5. After two days the growth was streaked on liver agar plates p_H 5.8.[8] The colonies were examined microscopically and were transferred to a dextrose broth of p_H 6.8 after forty-eight hours. Following one week's incubation, the hydrogen ion concentration of the broth was examined colorimetrically (Cullen). The culture was considered positive when any of the tubes from which the organisms were isolated showed a reaction on the acid side of p_H 5. This point was chosen rather than p_H 4 because it has been shown that decalcification can go on at this acidity if it is maintained over a long period.

Chemical Methods.—Blood for determinations of the calcium and phosphorus content and the refractive index was withdrawn following breakfast at intervals of six months. For the determination of calcium, a modification of the Clark-Collip[9] adaptation of the Kramer-Tisdall method was used.[10] Duplicate determinations were made in nearly all cases. With this method, the usual values range between 9 and 10.5 mg. per hundred cubic centimeters. For the determination of

8. Torrey, J. C.: New Differential Plating Methods for B. bifidus and B. acidophilus (Moro), J. Bact. **2**:435, 1917.

9. Clark, E. P., and Collip, J. B.: A Study of the Tisdall Method for the Determination of Blood Calcium with a Suggested Modification, J. Biol. Chem. **63**:461, 1925.

10. Details concerning calcium, inorganic phosphorus and protein in the same children will be presented in a subsequent publication.

inorganic phosphorus, Tisdall's method [11] was used in the majority of our cases. In some instances, the method of Fiske and Subarrow [12] was substituted. No change was made in the method used for individual patients on repeated examinations. In agreement with the results of Bullock,[13] the range of inorganic phosphorus was found to be between 4 and 5 mg. per hundred cubic centimeters in subjects between the ages of 5 and 15 years.

Dietary Classification.—The following groups were designated: 1. Good diet, containing at least three or four glasses of milk,[14] one piece of fruit,[15] one serving of green vegetables, 1 ounce (30 Gm.) of butter, and meat, eggs or fish at least once daily. In addition, the children were allowed liberal quantities of other foodstuffs, such as cereal, bread, potatoes, spaghetti and cheese. 2. Good diet plus viosterol. Viosterol 100 D [16] was added to the diet. Children from 4 to 6 years received 10 drops; those from 6 to 12 years, 15 drops, and those over 12 years, 20 drops daily. Viosterol was given for six weeks and omitted for two weeks, and the procedure was repeated throughout the entire period of observation, except that viosterol was not administered during July and August. In the fall of 1930, viosterol 100 D was changed to viosterol 250 D, the dosages remaining unchanged. 3. Good diet, plus irradiation with ultraviolet rays from the mercury vapor arc in quartz. The children in this group were given irradiation [17] twice weekly for six weeks, beginning with a minimum exposure of two minutes and culminating in a maximum exposure of thirty minutes. The course of treatment was repeated on three occasions, in the spring of 1930, in the fall of 1930 and in the spring of 1931. 4. Poor diet (control). The "poor" diets were deficient in at least one, and usually more, of the essential constituents of the "good" diets, such as milk, fruit, vegetables and additional protein (meat, fish, eggs). The diets of some children were below the maintenance requirement, owing to lack of funds. No change was made in the diet, since this group served as a control. 5. Poor diet plus viosterol. Viosterol was added in the same manner as in group 2. 6. Poor diet plus fruit. This group was supplied with three oranges daily. 7. Poor diet plus irradiation with the mercury vapor arc in quartz. Ultraviolet irradiation was administered as in group 3.

In the fall of 1930, a group of 134 children was added to those already under observation. They were observed until the late fall of 1931 and are included in the total of 319 previously mentioned. Eighty-nine of the children were on a good diet and 45 on a poor diet; 33 of the former group and 20 of the latter were given viosterol in larger doses than previously mentioned, namely, from 4 to 9 years, 20 drops; from 9 to 12 years, 30 drops, and over 12 years, 40 drops, daily.

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11. Tisdall, F. F.: A Rapid Colorimetric Method for the Quantitative Determination of the Inorganic Phosphorus in Small Amounts of Serum, J. Biol. Chem. **50**:329, 1922.

12. Fiske, C. H., and Subarrow, Y.: The Colorimetric Determination of Phosphorus, J. Biol. Chem. **66**:375, 1925.

13. Bullock, J. K.: Physiological Variations in Inorganic Blood Phosphorus Content at Different Age Periods, Am. J. Dis. Child. **40**:725 (Oct.) 1930.

14. Milk was supplied by the Borden's Farm Products Company, Inc., New York.

15. In the majority of the cases, orange was the fruit used; in the other cases either apples, pears or bananas were taken by the children.

16. Viosterol was supplied by the Mead Johnson Company, Evansville, Ind.

17. A mercury vapor lamp was supplied by the Hanovia Chemical and Manufacturing Company, New York.

A daily diet slip was given to each child for recording the allotted foodstuffs, and the children were instructed to check the quantity of food eaten daily, candy being included. Frequent visits to the homes by a full time social worker served as a check on the reports on the allotted diet.

RESULTS

Effect of Various Diets on Dental Caries.—For purposes of clarity the results will be presented under two main headings: (1) the effect of various factors on the condition of the teeth previous to observation (original classification) and (2) their effect on the development of caries during observation (new caries).

Data were collected on the relation of breast feeding to artificial feeding in infancy, as well as on the relation of diets in later childhood to the presence of dental caries at the onset of the observation. It was found that maternal nursing is not an important factor in mitigating the development of caries. An analysis of the diets immediately preceding the period of observation showed that more children who had marked caries (group D) lacked fruit, milk or vegetables than those who had a moderate degree of caries (group B).

These results, which in themselves are inconclusive, receive confirmation from the more detailed data collected during the period of observation.

It is evident from table 1 that, during observation, in the children who were on a good diet (groups 1, 2 and 3) fewer cavities per child developed than in those who were on a poor diet (group 4). The fact that there was no difference in the development of caries between groups 1, 2 and 3 seems to indicate that the addition of viosterol (group 2) or irradiation with the mercury vapor arc in quartz (group 3) to a well balanced diet does not further reduce the incidence of caries. The addition of viosterol to a poor diet (group 5) notably diminished the development of new cavities, since this group showed the same number of new cavities as the groups on a good diet.[18] The exposure to ultraviolet irradiation (group 7) and the addition of fruit (group 6) to a poor diet were less effectual, the development of new cavities being reduced from 1.96 to 1.2 and 0.82 cavities per child, respectively.

Chart 1 is arranged to show the percentage of children in groups 1, 2, 4 and 5 (table 1) in whom there developed no new cavities, one new cavity and two or more cavities during observation. It is evident from this chart that in the two groups receiving a good diet with (group 2) and without (group 1) viosterol the percentage of children without new caries was about the same, slightly above 60 per cent. In the group on

18. The distribution of the cases according to the number of cavities present at the beginning of the observation (groups B, C, D) was not significantly different in all the groups. The smaller number of extractions in groups 4, 5 and 6 was due to the smaller number of deciduous teeth present at the beginning of the observation.

TABLE 1.—*Effect of Different Diets on the Development of Dental Caries*

Group	Diet	Number of Children	Average Age, Yrs.	Oral Classification			Original Number of Teeth		Original Number of Cavities		Teeth Extracted		Teeth Remaining		New Cavities		Per Child		Period of Observation, Mos.
				B	C	D	Deciduous	Permanent	Deciduous	Permanent	Deciduous	Permanent	Deciduous	Permanent	Deciduous	Permanent	New Cavities	Extractions	
1	Good	117	10.62	42	44	31	608	2,110	497	729	172	32	430	2,297	21	45	0.56	1.74	13.0
2	Good plus viosterol	88	9.72	22	41	25	639	1,359	536	1,359	152	18	473	1,520	10	36	0.52	1.90	13.0
3	Good plus quartz light	12	9.6	2	5	5	73	203	70	93	24	4	56	214	3	4	0.53	1.98	13.1
4	Poor (control)	46	12.32	15	15	16	140	983	115	488	43	20	93	1,004	4	86	1.96	1.4	13.0
5	Poor plus viosterol	34	10.56	5	14	15	104	724	138	432	29	21	75	765	3	15	0.53	1.47	12.7
6	Poor plus fruit	11	13.8	6	2	3	3	280	2	122	2	6	1	279	..	9	0.82	0.72	15.0
7	Poor plus quartz light	11	9.7	1	3	7	95	168	93	83	29	6	66	192	5	8	1.2	1.9	14.0

a poor diet who received viosterol (group 5), the result was equally good (60 per cent). In the control group on a poor diet (group 4), the number of children in whom new cavities did not develop fell to

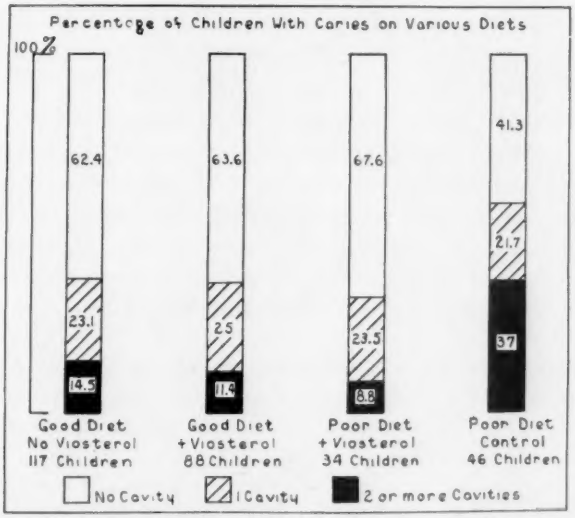

Chart 1.—Percentage of children with caries on various diets.

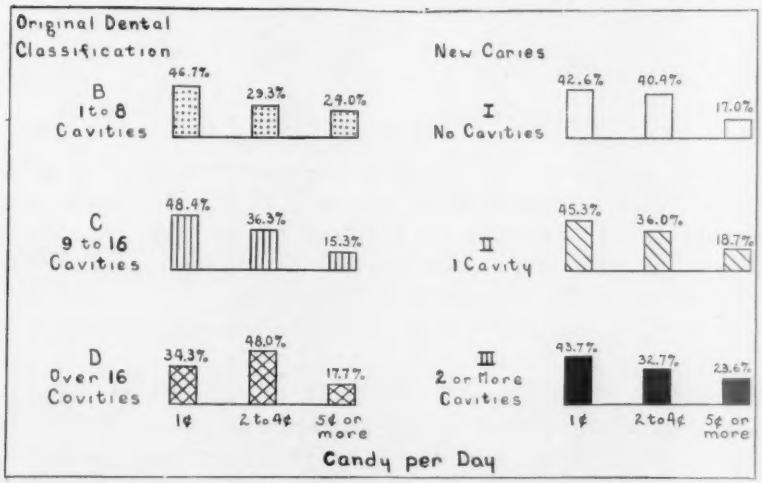

Chart 2.—Influence of the ingestion of candy on the development of caries.

41 per cent. We attempted to evaluate our results on a statistical basis, which indicated that there is a significant difference[19] between the

19. A difference was considered significant when the differences between the means of the various groups exceeded by threefold or more the differences of their respective probable errors.

control group (4) and the three other groups (1, 2 and 5), and that the differences between groups 1, 2 and 5 are insignificant.

Effect of Candy on Dental Caries.—The results summarized in chart 2 indicate that the ingestion of small or large amounts of candy (cheap chocolate and lollypops) had no relation to the number of cavities present at the beginning of the observation and did not influence the development of new caries.

Relationship Between Calcium and Phosphorus Levels of Serum and Original Dental Classification.—The serum of 200 children was examined before the institution of therapy. No correlation was apparent between the levels of calcium and phosphorus or the calcium-phosphorus ratio and the original dental classification (groups B, C and D). A physiologic drop in the phosphorus level of the serum occurs between the ages of 15 and 18 years.[13] For this reason, this age group was

TABLE 2.—*Relation of Calcium and Phosphorus to New Caries*

New Cavities			Calcium					Phosphorus			
			Increase		Decrease			Increase		Decrease	
Number	Period of Observations, Mos.	Total Cases	Number of Cases	Per Child, Mg. %	Number of Cases	Per Child, Mg. %	Total Cases	Number of Cases	Per Child, Mg. %	Number of Cases	Per Child, Mg. %
None	6	87	40	0.49	47	0.43	121	61	0.48	60	0.47
	12	52	17	0.33	35	0.69	67	15	0.54	52	0.49
1	6	29	16	0.45	13	0.54	47	18	0.48	29	0.48
	12	13	6	0.21	7	0.49	19	7	0.47	12	0.69
2 or more	6	15	11	0.46	4	0.79	24	8	0.54	16	0.63
	12	9	3	0.31	6	0.72	14	8	0.53	6	0.83

considered separately. The decline of phosphorus values with age was as marked in children with little caries as in those with rampant caries. Our data in the latter group on statistical analysis confirmed the fact that there is no simple relation between the calcium and phosphorus levels and the degree of caries initially present.

Relationship Between Calcium and Phosphorus Levels of Serum and Progression or Arrest of Caries.—Table 2 shows the relationship between the arrest or progression of caries and the increase or decrease of serum calcium and phosphorus from the initial levels. The majority of these cases showed a lowering of the phosphorus level, the reduction being independent of any arrest or progression of caries.

It was of interest to see whether the children whose serum phosphorus was low preceding this study would show an increase during observation. Of 18 children receiving viosterol or ultraviolet irradiation with the mercury vapor arc in quartz who at the first examination had a low phosphorus content, 14 showed an increase after six months of an average of 0.62 mg. per hundred cubic centimeters, while of

15 children who did not receive viosterol or ultraviolet radiation, 12 showed an increase of 0.57 mg. After one year, the increase or decrease of phosphorus in both groups was equally distributed among those cases in which the serum could be reexamined. This was verified by statistical analysis.

OTHER SYSTEMIC FACTORS

Age.—Because of the difference in the ages of the children in the groups on various diets, the incidence of new caries was calculated for the separate age groups. The following incidence of caries was found: from 4 to 9 years, 0.73 cavity per child; from 9 to 12 years, 0.44 cavity, and from 12 to 16 years, 1.03 cavities. This incidence indicates that although in our group the manifestation of caries in

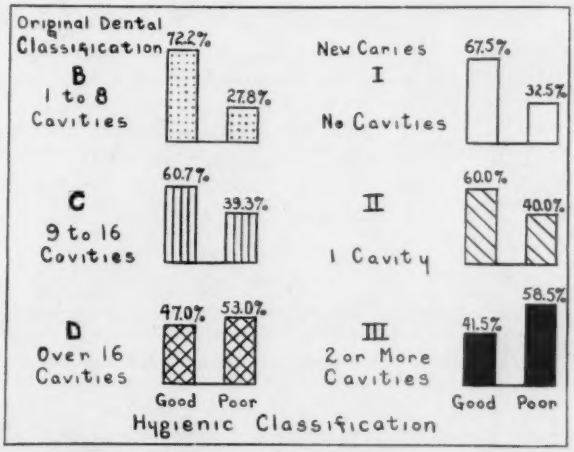

Chart 3.—Relation of oral hygiene to the development of caries.

younger and older children is comparable, it is slightly greater during the age of puberty. This difference, which is due to the influence of age, is not as great as the difference between the control and test groups (table 1).

Heredity.—The dental classifications of parents and those of children were plotted against each other in 198 cases. Each pair of parents was counted as one unit; e. g., if the mother was in group 1 and the father in group 3, they were counted as 4. It was found that the average of the parents of children in group B was 4.5; in group C, 4.7, and in group D, 4.8. A statistical analysis of these data showed that the difference between the means of groups B and D was only slightly greater than the difference of their respective probable errors. Therefore the slight difference between the groups is of no significance.

LOCAL FACTORS

Oral Hygiene.—Among the factors which may be responsible for susceptibility to caries, the protagonists of the movement for oral hygiene consider cleanliness of the teeth of great importance. It can be seen from chart 3 that good oral hygiene is more often associated with relative freedom from caries than with rampant caries. However, it it evident that marked decay may occur in mouths in which the hygienic condition is good.

Bacteriology of Oral Cavity.—The results shown in table 4 indicate that acid-producing organisms were present in all mouths examined at the beginning of the observation. The incidence of gram-positive acidogenic bacilli was greatest in the mouths with marked caries (96.5 per cent), but they were also found in mouths without caries. In more than 50 per cent of the cases, gram-positive acidogenic bacilli were

TABLE 3.—*Relation of Oral Flora and Dental Classification*

Dental Classification	Number of Cases	Gram-Positive Acidogenic Bacilli			Other Acidogenic Organisms Positive
		Positive†	Negative‡	*	
A	3	3	..	..	2
B	40	31	9	20	28
C	38	34	4	21	20
D	28	27	1	19	13
Total	109	95	14	60	63

* Indicates that gram-positive acidogenic bacilli were found in all parts of the oral cavity.
† "Positive" indicates that gram-positive acidogenic bacilli were found in at least one culture from the oral cavity.
‡ "Negative" indicates that no gram-positive acidogenic bacilli were found in any part of the mouth.

found in all parts of the oral cavity. The fact that acid-producing organisms were present in all mouths suggests that their presence does not necessarily lead to the development of caries. For technical reasons the determinations could not be repeated during the course of the observation.

Hypoplasia.—It seemed of interest to determine whether the children who had marked hypoplasia showed a greater incidence of caries than those without marked structural defects. The distribution of the 34 children according to the original classification was: group A, 1; group B, 11; group C, 14, and group D, 8—about the same as the total group. The one child in the entire group who had no cavities (group A) had marked hypoplasia. There was a remarkably low incidence of new caries during observation, 0.44 cavity per child. Only 3 of the children were on poor diets, and it is noteworthy that in 2 of them 2 new cavities developed; the other had no cavities. It may therefore be concluded that faulty structure per se does not necessarily lead to the development of caries.

COMMENT

An analysis of the diets of our children made prior to the period of observation showed that a large number received "borderline diets" or diets which were actually deficient in several of the essential foodstuffs. In many instances, a correction of the dietary deficiencies led to the arrest of caries. We realize the difficulty encountered in all attempts to attribute improvement to one factor, because of the many variables involved in observations on human beings.[20] These data would not indicate that any one constituent of the diet is all-important.

The evidence cannot be considered conclusive, since the number of children who received viosterol, fruit or milk in addition to poor diets was not sufficiently large.

The investigations of Mellanby and her collaborators [21] indicated a beneficial effect with cod liver oil and viosterol, and our results with children on poor diets to which viosterol was added are in agreement with their observations. Those children who received large doses of viosterol in addition to good diets did not show greater improvement than those given smaller doses or those who were on a well balanced diet. It is impossible to explain, from our data, why the 11 children who received irradiation with a mercury vapor arc in quartz with a poor diet showed more extensive caries than those receiving viosterol. The dosages of ultraviolet irradiation which were used are considered sufficient to produce healing of rickets in infants. Further work may explain this discrepancy.

Hanke and his collaborators [22] advocated the use of large quantities of citrus fruit and obtained remarkable results, which they attributed to the action of vitamin C. However, since orange juice contains appreciable amounts of minerals and vitamin C, it is questionable whether the favorable action of the orange juice is due to one of these constituents or to some other unknown substance. Our data do not permit a conclusion concerning this subject.

Sherman and his collaborators [23] have shown that the calcium and phosphorus content of a quart of milk is desirable in order to provide a sufficient quantity of those minerals for the growing organism. The

20. McCollum, E. V.: Relationship Between Diet and Dental Caries, J. Dent. Research **11**:553, 1931.

21. Committee upon Dental Research: The Influence of Diet on Caries in Children's Teeth, Medical Research Council, Special Report Series, no. 159, London, His Majesty's Stationery Office, 1931.

22. Hanke, M. T.; Marberg, C. M., and Tucker, W. H.: The Rôle of Nutrition as a Factor in the Prevention and Treatment of Dental Disease, Arch. Path. **13**:532 (March) 1932.

23. Sherman, H. C., and Hawley, E.: Calcium and Phosphorus Metabolism in Childhood, J. Biol. Chem. **53**:375, 1922.

detailed analysis of our good diet indicated more favorable results in those children whose diet contained four glasses of milk daily. However, in a number of children under observation who received only three glasses of milk or less daily caries did not develop.

It seems impossible to determine the exact amount of any substance that a child must receive in order that caries may be prevented or arrested. Since the cause of dental caries is unknown, a well balanced diet, such as was used in the studies of Boyd and his collaborators,[4a] by Bunting and his co-workers [4b] and in this investigation, would seem to be desirable.

Mellanby [1e] found that puppies on diets that contained an excess of oatmeal had poorer teeth than those receiving no oatmeal. In the human diet, an excess of carbohydrate is believed to be responsible for the development of caries.[24] Our observations do not seem to support this widely accepted hypothesis as far as the easily soluble carbohydrates are concerned. Several children in our study who spent from $1.50 to $2.00 a week for candy did not show caries. These results indicate that candy has no detrimental effect on the teeth if it does not interfere with the regular ingestion of necessary foodstuffs.

All investigations on the dietary treatment of dental caries are based on the assumption that it is possible to influence the composition of the enamel and dentine of erupted teeth by changing the composition of the body fluids. The studies of Howe, Boedecker and Muench [25] provided evidence of circulation of fluid within the enamel. The results of our chemical examinations of the blood fail to explain the mechanism of the arrest of caries. Other investigators did not find a difference in the calcium and phosphorus of the serum of adults with and without caries.[26] This does not necessarily imply that the calcium and phosphorus contents of the body fluids play no rôle in the development of caries, but indicates that the mechanism is more complicated and requires further study.

No correlation between the manifestations of caries in the teeth of the parents and in those of their offspring was found. The informa-

24. Wallace, J. S.: The Physiology of Oral Hygiene and Recent Research, ed. 2, London, Baillière, Tindall & Cox, 1929, p. 20.

25. Howe, P. R.: Decalcification of Teeth and Bones, and Regeneration of Bone Through Diet, J. A. M. A. **79**:1565 (Nov. 4) 1922. Boedecker, C. F.: Nutrition of the Dental Tissues, Am. J. Dis. Child. **43**:416 (Feb.) 1932. Muench, J.: Neuere Untersuchungen über Lebensvorgänge im Zahnschmelz, Verhandl. d. Phys.-med. Gesellsch., Würzburg **55**:118, 1930.

26. Karshan, M.; Krasnow, F., and Krejci, L. I.: Study of Blood and Saliva in Relation to Immunity and Susceptibility to Dental Caries, J. Dent. Research **11**:573, 1931. Hanke, M. T.: Relation of Diet to General Health and Particularly to Inflammation of Oral Tissues and Dental Caries, J. Am. Dent. A. **17**:957, 1930. Hanke, Marberg and Tucker.[22]

tion available on this subject in the literature is meager. Further investigations on a large scale, the blood group of the parents being taken as a guide, might be of advantage in evaluating this relationship.

In this paper, systemic factors, such as age and heredity, have been shown to have a less notable effect on the condition of the teeth than diet. The local factors, oral hygiene and the presence of acid-producing organisms in the oral cavity, were considered. A certain correlation was found between good hygiene and freedom from caries. However, these results are far from absolute, as it was noted that a clean tooth may decay and an unclean tooth may not decay.

It is believed that bacteria play a definite rôle in the etiology of dental caries.[27] Some investigators in this field isolated acidogenic bacilli from the mouth and considered these organisms as the specific cause of dental caries.[28] In our study, acidogenic bacilli were recovered from the mouth with and without the presence of caries, suggesting that other factors may be more important.

The condition of the mouth at the beginning of the observation seemed to be of some importance in the subsequent development of caries. Children with a B, C or D classification showed 0.47, 0.53 and 1.24 new cavities, respectively. As this difference was not due to age, it indicates that children who have what may be called a carious diathesis are more likely to show new cavities than those who are relatively free from caries. It shows the importance of an accurate initial classification, as results may be due entirely to different tendencies in the mouths of children rather than to the effect of therapy.

It was of interest that the children with marked structural defects of the enamel (hypoplasia) who received an adequate diet did not show a higher incidence of caries than those whose teeth had good structure. This observation throws some doubt on the emphasis laid on structural defects as predisposing to caries.

The significance of roentgenograms in the detection of caries has been emphasized by other investigators.[29] Roentgen examination modified our results considerably, owing to the fact that an appreciable percentage of cavities which were not detected clinically was observed in

27. Miller, W. D.: Einfluss der Mikroorganismen auf die Caries der menschlichen Zähne, Arch. f. exper. Path. u. Pharmakol. **16**:291, 1882.

28. McIntosh, J.; James, W. W., and Lazarus-Barlow, P.: An Investigation into the Etiology of Dental Caries: I. The Nature of the Destructive Agent and the Production of Artificial Caries, Brit. Dent. J. **43**:728, 1922. Rodriguez, F. E.: Studies in the Specific Bacteriology of Dental Caries, Mil. Dent. J. **5**:199, 1922. Bunting, R. W.: A Text-Book of Oral Pathology for Students and Practitioners of Dentistry, Philadelphia, Lea & Febiger, 1929, p. 184.

29. Miner, L. M. S.: Dean Miner's Report, Harvard Dent. Rec. **6**:9 (Jan.) 1932.

roentgenographic checkup. It is our belief that in studies of this kind—limited as they are—differences in results may be explained by a difference in the technic of examination, and that the general use of the roentgenogram is of great assistance in making them comparable.

SUMMARY

Three hundred and nineteen children, from 4 to 16 years of age, attending a dental clinic, were observed for approximately thirteen months. In 63 per cent of the children who received a well balanced diet supplemented by milk and fruit, with or without viosterol or ultraviolet irradiation, no cavities developed; in 23 per cent, 1 cavity, and in 14 per cent, 2 or more cavities. In the control group on a poor diet, 40 per cent of the children remained free from caries; in 21 per cent 1 new cavity developed, and in 37 per cent, 2 or more cavities. It is evident that the children on a poor diet showed a higher incidence of caries. Sixty-eight per cent of a smaller group of children receiving a poor diet with viosterol remained free from caries; in 23 per cent 1 cavity developed and in 9 per cent, 2 or more cavities. These results are comparable to those obtained in the group on a good diet. It is not possible from our data to attribute dental caries to the lack of any single dietary factor. These results, however, indicate that a well balanced diet plays a definite rôle in the control of caries.

Repeated determinations of the calcium and phosphorus of the serum of these patients did not indicate a relationship between the effect of diet on caries and the level of these substances.

The possible influence of a variety of systemic factors, such as breast feeding, heredity and age, on caries was analyzed without any striking relationship being revealed.

Oral hygiene, the bacterial flora of the mouth, and hypoplasia were studied. One of these factors, oral hygiene, showed a possible relation to the presence of caries.

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HEMOGLOBIN CONTENT OF THE BLOOD OF INFANTS

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Studies of anemia in infants await the establishment of a normal hemoglobin curve for children. A survey of the literature reveals that investigations on this subject are not only few but conflicting in results. There seems to be general agreement, however, that the hemoglobin level is very high at birth and that it falls rapidly during the first few weeks of life. A level somewhat lower than the average adult value is soon reached and remains fairly constant throughout infancy. Average values given by different workers for any particular age during this period vary from about 50 to 100 per cent of an arbitrary adult male standard. It is not surprising to find such wide differences, because the standards which have been used vary from 13.8 to 17.2 Gm. of hemoglobin per hundred cubic centimeters of blood. Results for children based on a standard established for adults are misleading. Figures obtained by different workers are comparable only when they are reported in grams per hundred cubic centimeters of blood and given for a specific age.

There have been two outstanding investigations concerning the hemoglobin content of the blood of children, namely, the work of Williamson [1] conducted in 1916 and the recent work of Mackay.[2] An excellent survey of previous investigations is included in Mackay's report. It is difficult to use the absolute values established by these workers because Williamson employed a spectrophotometric method that is not in general use at the present time, and Mackay made her studies in England with the Haldane method, which is rarely used in this country.

From the Department of Agricultural Chemistry, University of Wisconsin.

1. Williamson, C. S.: Influence of Age and Sex on Hemoglobin, Arch. Int. Med. **18**:505 (Oct.) 1916.

2. Mackay, H. M. M.: Nutritional Anemia in Infancy, Medical Research Council, Special Report Series, no. 157, London, His Majesty's Stationery Office, 1931.

Since the Newcomer method is used widely in this country, we felt that values obtained by this method for a large number of children would aid greatly in the establishment of a normal hemoglobin curve. The results which are presented in this paper were obtained from determinations made during the past four years. The Newcomer method was used throughout the entire period, but three different glass disks were employed as standards. Each disk was recalibrated against standard acid hematin solutions according to the method outlined by Elvehjem.[3] The calibration of the earlier disks sold by Bausch and Lomb was found to be inaccurate, and a correction factor was established for each disk. The calibration of the disks on the market at the present time checks well with our standard hematin solutions. About one third of our values were obtained by the use of a new disk. The remainder of the determinations were made with older disks, but each of these figures has been corrected by the use of a proper conversion factor. Our figures are therefore comparable to those obtained in all laboratories using the new disks.

EXPERIMENTATION

The majority of the children studied were healthy infants brought to the child health centers of the Madison Public Health Nursing Association. The data for infants under 1 month of age were obtained at the Wisconsin General Hospital. All the children were of white parentage. The samples of blood were taken between the hours of 2 and 5 in the afternoon. The plan was to make determinations on the same child every four weeks for a considerable period, but in some cases only one or two readings were obtained on the same subject because the child did not return to the clinic. The sample of blood was obtained from the great toe or heel of an infant or from the ear of an older child. The blood was diluted 1 : 500 with tenth-normal hydrochloric acid and allowed to stand at least forty minutes in order to permit complete development of color. The hemoglobin was then determined by comparison of the yellow color with a standard disk in a Bausch and Lomb colorimeter and was calculated as grams of hemoglobin per hundred cubic centimeters of blood.

All values for premature infants, twins and children definitely anemic or receiving treatment for anemia were excluded from our composite results. After these figures were omitted, there remained about 2,000 determinations on 750 children varying in age from birth to 5 years.

3. Elvehjem, C. A.: The Preparation of Standard Acid Hematin Solutions from Hemin, J. Biol. Chem. **93**:203 (Sept.) 1931.

In the table are given the average values for different age periods. The average was calculated for two week periods during the first month because the values were decreasing so rapidly. Four week periods were used between the ages of 4 and 80 weeks, and eight week periods between 80 and 128 weeks. After the age of 128 weeks the remaining figures were grouped into two divisions, from 128 to 152 weeks and from 152 to 260 weeks. The number of determinations used for the calculation of the average in each group as well as the lowest and highest reading for that group is also included in the table.

Hemoglobin Content of the Blood of Madison Children (750 Subjects; 2,000 Determinations)

Age in Weeks	Number of Determinations	Gm. Hemoglobin per 100 Cc. Blood		
		Lowest	Highest	Average
0-2	21	18.8	27.0	22.2
2-4	27	13.2	21.9	17.9
4-8	89	8.3	19.4	13.4
8-12	118	8.8	17.6	11.7
12-16	126	9.1	15.5	11.9
16-20	135	8.3	15.5	12.0
20-24	141	8.2	15.1	12.2
24-28	116	8.5	16.0	11.8
28-32	118	8.0	15.2	11.6
32-36	118	8.5	15.7	11.8
36-40	110	8.8	14.9	11.5
40-44	91	8.0	14.0	11.4
44-48	84	8.0	14.9	11.5
48-52	77	8.4	15.1	11.6
52-56	82	9.4	14.7	11.5
56-60	63	8.3	14.2	11.6
60-64	41	8.0	13.7	11.1
64-68	45	9.0	14.1	11.6
68-72	38	9.4	13.9	11.0
72-76	39	8.8	15.9	11.4
76-80	32	8.7	16.1	11.4
80-88	50	8.4	13.7	11.8
88-96	45	10.0	13.6	11.9
96-104	51	8.9	14.4	11.9
104-112	33	9.4	14.0	11.9
112-120	20	9.0	13.3	11.2
120-128	25	8.8	13.9	11.6
128-152	48	10.2	14.2	12.3
152-260	49	9.6	15.3	12.5

The curve constructed from the average values is given in chart 1. The values are very high at birth, fall rapidly and reach a low point at the age of from 8 to 12 weeks. This point is undoubtedly higher than that for any given subject for two reasons: because all children do not reach the low point at the same age, and because this point represents the average of figures obtained over a period of four weeks. There is a small increase between the ages of 12 and 24 weeks, and a slight decrease thereafter. The figures remain between 11 and 12 Gm. during the next two years. Appleton[4] found an average of

4. Appleton, V. B.: Determination of Hemoglobin During Infancy by the Palmer and Van Slyke Methods, J. Biol. Chem. **34**:369 (May) 1918.

11.7 Gm. (85 per cent of 13.8) per hundred cubic centimeters of blood for 12 children between the ages of 11 and 23 months. There is a tendency for the values to increase after the age of 2½ years.

Curves constructed from the results obtained by Williamson and Mackay are included in chart 1 for comparison. There are only five points on Williamson's curve, and each value is the result of about thirty analyses. Although variations from month to month cannot be detected from this curve, it is readily seen that the general outline is almost similar to that of the curve constructed from the data for children in Madison. All of Williamson's figures are approximately 10 per cent higher than our values. This difference is nearly the same as the difference between the values of from 15.6 to 15.8 Gm. given by Foster

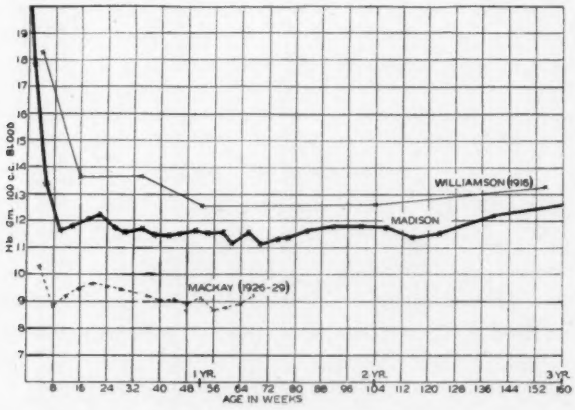

Chart 1.—A comparison of the hemoglobin curve constructed from the average figures given in the table and the curves drawn from the data of Williamson and Mackay.

and Johnson,[5] Haden[6] and Osgood[7] as the standard for men from 18 to 30 years old, and the value of 16.9 Gm. established by Williamson as the standard for adult males. It has been suggested[8] that Williamson's figures are too high, because he used for the standardization of

5. Foster, P. C., and Johnson, J. R.: Oxygen Capacity and Hemoglobin Content of Normal Blood of Men, Proc. Soc. Exper. Biol. & Med. **28**:929 (June) 1931.

6. Haden, R. L.: Accurate Criteria for Differentiating Anemias, Arch. Int. Med. **31**:766 (May) 1923.

7. Osgood, E. E.: Tables for Calculation of Color Index, Volume Index and Saturation Index Based on Recently Determined Standards, J. Lab. & Clin. Med. **12**:899 (June) 1927.

8. Peters, J. P., and Van Slyke, D. D.: Interpretations in Quantitative Clinical Chemistry, Baltimore, Williams & Wilkins Company, 1931, p. 544.

his method recrystallized hemoglobin which contains, according to Barcroft,[9] some methemoglobin.

The values used for the curve representing Mackay's results were obtained by multiplying the hemoglobin percentage given in her paper for the artificially fed untreated infants (all cases from 1925 to 1929) by 13.8, because the standard which she used was so calculated that 100 per cent represents 13.8 Gm. of hemoglobin per hundred cubic centimeters of blood. Each point on the curve is based on the average of about one hundred determinations.

The shape of the curve constructed from Mackay's results is practically identical to that of our curve, but all of her values are correspondingly lower than those obtained in Madison. This difference is undoubtedly due to two factors. First, her results were obtained by the use of a different method and were based on a different standard. Secondly, a large portion of the children studied by her had low hemoglobin values due to anemia. She suggests that from 40 to 50 per cent of the infants studied in London were suffering from a mild form of anemia. The incidence of anemia cannot explain the entire difference, because when 80 per cent of hemoglobin, which is given by Mackay as a normal value for children older than 5 months, is multiplied by 13.8, the product (11 Gm.) is still somewhat lower than our figures. A direct comparison would be more reliable if all workers used the same method for the determination of hemoglobin and expressed the values in grams per hundred cubic centimeters of blood. If we disregard the absolute figures and consider only the relative values in the curves drawn from Mackay's and our data, we find that both studies show the same trend in hemoglobin values. The values fall rapidly from birth to the age of from 8 to 12 weeks, rise from 12 to 24 weeks, fall slowly thereafter, and reach a low level at about 1 year.

The results presented in the table show that in many cases there is a difference of from 6 to 7 Gm. between the lowest and the highest hemoglobin value. This introduces the question of distribution. Are the majority of the figures scattered over this wide range, or do these divergent results represent only a few cases? In order to answer this question we have studied the distribution of the individual hemoglobin values at different ages. The distribution for the age periods from 4 to 8 weeks, from 24 to 28 weeks, from 52 to 56 weeks and from 92 to 104 weeks is given in chart 2. The number of figures in each group, except the period from 92 to 104 weeks, which included sixty-nine values, is given in the table.

9. Barcroft, J.: The Respiratory Function of the Blood: II. Haemoglobin, London, Cambridge University Press, 1928.

The distribution between the ages of 4 and 8 weeks is scattered and somewhat unsymmetrical. This is to be expected, since the amount of hemoglobin is decreasing at a rapid rate during this period. The readings taken at from 4 to 5 weeks of age are high, while those taken at from 7 to 8 weeks have reached lower levels. In the other groups the distribution of the figures is more closely centered around the average value. It is interesting to find that almost 80 per cent of the figures for the periods from 24 to 28 weeks and from 52 to 56 weeks fall within a range of 3 Gm., namely, between 10 and 13 Gm. Osgood [6] found that 90 per cent of the results for adult males fell between 11 and 14 Gm. In over 70 per cent of the infants in the group from 92 to 104 weeks of age, the values fall between 11 and 14 Gm. These

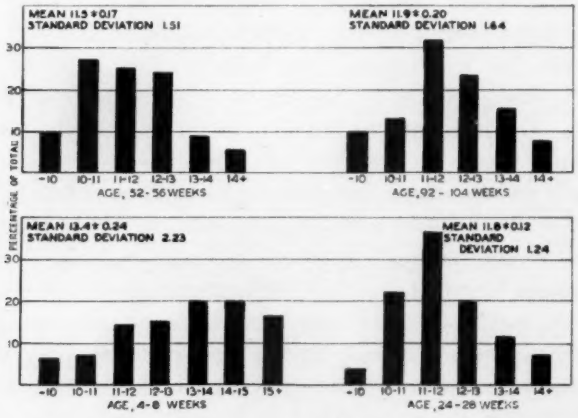

Chart 2.—The distribution of the hemoglobin values studied at four different age periods.

results demonstrate that average figures for each period closely approximate the typical value for that particular age.

When the values for the boys and for the girls were separated and plotted in different curves, they were found to be practically identical. Since Williamson [1] has shown that sex does not influence the hemoglobin content of the blood of young children, it is not necessary to present the curves in this paper. It is sufficient to state that his conclusions have been substantiated.

It is impossible to conclude that the curve presented in chart 1 is a normal hemoglobin curve for children in all parts of the United States. The data obtained in Madison are probably typical of values which may be found for children from average homes in most American cities. However, more data are necessary before a normal curve can be constructed even for limited areas. When such data are obtained, they

cannot be used for the construction of a normal hemoglobin curve until one assumes that the child in an average home is normal. We have no proof for this assumption. For example, the hemoglobin value for boys between the ages of 6 months and 2½ years is about 4 Gm. less than the normal value for adult males. Is this a normal physiologic condition, or do the majority of children suffer from a lack of hemoglobin? This question can be answered only by study of the hemoglobin content of the blood of children receiving diets known to be effective in the formation of hemoglobin.

We have made a very elementary attempt to answer this question by studying a few children who were receiving a good diet of natural foodstuffs. The milk diet of these children was supplemented grad-

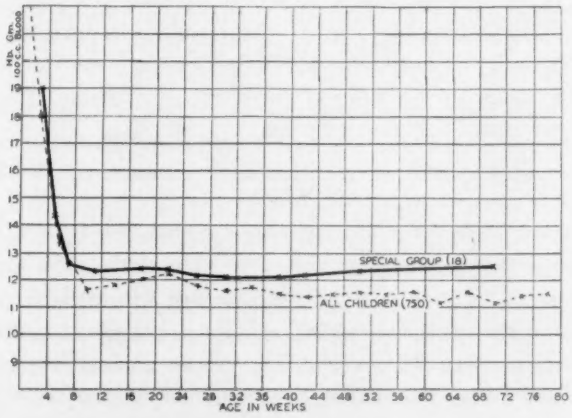

Chart 3.—The effect of a good diet of natural foodstuffs on the hemoglobin content of the blood of infants.

ually by the addition of orange juice at 1 month, egg yolk at 3 months, cereal at 4 months and vegetables at 6 months. It would be erroneous to suggest that such a diet furnishes the optimum amount of nutrients for the formation of hemoglobin, because it may be low in iron, but it is considered by most pediatricians to be a good dietary regimen. The results for 18 children receiving such a diet are plotted in chart 3. Although the hemoglobin values for these children are slightly higher than the composite curve, there is no significant difference in the figures for the two groups during the first six months of life. The values for the special group, however, show an upward trend at an earlier age than do the values for all the children. This is to be expected if the special diet furnishes any additional iron, because undoubtedly many of the children whose values were included in the composite curve were receiving a minimum supply of iron at about 1 year of age. Even

with a special diet the hemoglobin fell to approximately 12 Gm. per hundred cubic centimeters of blood. These results demonstrate that the hemoglobin content of the blood of children receiving a diet considered to be normal in every way falls to a level at least 3 Gm. below the amount found in adult blood. Mackay [2] has shown that the hemoglobin content of the blood of a large percentage of the children whom she studied could be increased by iron therapy. The upper levels which she reported are probably not above 12 Gm. per hundred cubic centimeters of blood. Bloxsom [10] has recently reported that a group of 57 infants receiving iron and copper in addition to the regular diet showed an average increase in hemoglobin of from 5 to 15 per cent over a group of 104 children receiving no supplement. He made only a few determinations on 750 subjects varying in age from birth to 5 years is given. were rather low. Further work in which the diet is supplemented with iron and copper, elements known to stimulate formation of hemoglobin, is necessary in order to determine whether the low hemoglobin value during infancy is a normal condition or whether it is due to a low supply of blood-forming elements.

SUMMARY

1. A hemoglobin curve for infants constructed from 2,000 determinations on 750 subjects varying in age from birth to 5 years is given.

2. The hemoglobin content of the blood of infants was found to be high at birth (22 Gm.), but it fell rapidly and reached a low point at the age of from 8 to 12 weeks. There was an increase between the ages of 12 and 24 weeks, and a slight decrease thereafter. The hemoglobin remained between 11 and 12 Gm. until the infants were about 2½ years old, after which it increased gradually.

3. The rapid drop during the first few weeks of life and the low hemoglobin values recorded during the first six months were not prevented to any appreciable extent by the feeding of a good diet of natural foodstuffs. The hemoglobin values of the children on the special diet, however, began to increase at an earlier age than the average values for all the children.

Ruth Chambers, Bertha Schmid, Pearl Stoecklin, Gunvor Amundson, Hazel Eichler, Elaine Spevachek, Milada Prochaska, Kathryn Hensey, Jean Miller and Portia Glindeman assisted in making these hemoglobin studies.

10. Bloxsom, A. P.: Copper and Iron Requirements in Infancy, South. M. J. **25**:401 (April) 1932.

Case Reports

CLEIDOCRANIAL DYSOSTOSIS

AN ATYPICAL CASE IN A CHILD

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AND
FREDERICK CASTROVINCI, M.D.
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The syndrome of cleidocranial dysostosis, first described by Marie and Sainton in 1897,[1] is characterized by (1) an aplasia, more or less marked, of one or both clavicles; (2) exaggerated development of the transverse diameter of the cranium; (3) a delay in the ossification of the fontanel, and (4) hereditary transmission.

It is fairly well agreed by all reporting on the condition that the clavicular deformity is the most essential feature. The clavicular abnormality may consist of absence or underdevelopment of one or both clavicles. Cases are reported in which the midportion of one clavicle consisted of a fibrous cord. Fitzwilliams [2] reported twenty-four cases in which the clavicular deformity consisted of a ligamentous prolongation from the inner end outward. A great number of cases are on record in which only the sternal end of the clavicle is represented. Cases in which the acromial end alone is present are rare.

The other three criteria of the syndrome may or may not be present. The deformity of the cranium, rather marked in some cases, is not incompatible with changes attributable to rickets. Since the membranous bones of the skull, however, are those usually affected, thus delaying closure of the anterior fontanel, and since the clavicle, partially developed from membrane, is invariably abnormal, it has been concluded, perhaps unjustifiably, that this syndrome has to do with faulty or abnormal development of membranous bones. Cranial bosses, delay in the closure of the fontanels, delayed and abnormal dentition and even changes in the stature may rightly be attributed to rickets. The deformity of the clavicles, on the other hand, is a congenital abnormality. The various types of clavicular deformity are very aptly explained by variations in the anatomic development of the bone.

From the A. Jacobi Division for Children of the Lenox Hill Hospital, New York.

1. Marie, Pierre, and Sainton, Paul: Observation d'hydrocéphalie héréditaire (père et fils) par vice de développement du cerveau, Bull. et mém. Soc. méd. d hôp. de Paris **14**:706, 1897.

2. Fitzwilliams, D. C. L.: Hereditary Craniocleido Dysostosis, Lancet **2**:1466, 1910.

That heredity is not an indispensible criterion is demonstrated not only by the case to be described, but also by several cases reported in the literature. McBride [3] reported two cases, and Cocker and Sims [4] one case, in which no familial or hereditary history was present. McCurdy and Baer,[5] on the other hand, reported nine cases in three generations. They described the characteristic physical findings in these cases as follows: The patients were of small stature, with large brachycephalic heads showing prominent frontal, parietal and occipital bosses, with delayed closure of both sutures and fontanels; the lower jaw was prognathous; the hard palate was high and arched; dentition was late and irregular, and, most essential of all, the clavicles were defective.

The case to be presented is deemed atypical because of (1) the symmetrical nature of the lesion and (2) the presence of a calcified nodule just medial to the acromial portion of each clavicle. Search of the literature has failed to reveal a case demonstrating this separate area of calcification lying between the two separated portions of each clavicle. There are several explanations for its presence which will be discussed later.

REPORT OF A CASE

History.—The patient, a boy, aged 13 years, came for emergency treatment at the Lenox Hill Hospital on Dec. 20, 1931, complaining of an eponychium of the right index finger with cellulitis of the hand. Attention was drawn to the clavicles by the preternatural mobility of both arms when the child removed his coat. Examination revealed a small prominence over the midportion of both clavicles, somewhat more marked on the right side than on the left. No tenderness was elicited on pressure. The prominence could be easily depressed. The continuity of each clavicle was interrupted at the prominence. Both an outer and an inner portion were easily palpated and found to be freely movable. On abduction of the shoulder, separation of the two segments took place. The sternal portion was directed upward and anteriorly whereas the acromial portion was directed downward and somewhat posteriorly. The acromial portion measured 5.5 cm., whereas the sternal portion of the clavicle measured 6.5 cm. on both sides.

There was no limitation of motion of each shoulder. The carrying angle of each arm was not affected. Both arms were extended at right angles to the body, and could be raised directly upward with perfect ease and without pain. Both shoulders could be brought forward with ease, though they did not touch each other.

The patient was well developed, weighed 100 pounds (45.4 Kg.), and was 5 feet (152.4 cm.) tall. The circumference of the head was 55.5 cm. The forehead was prominent, but no prominent bosses were present. The dentition was fair; twenty-seven teeth were present, the left lower first molar having been removed. The hard palate was normal. No pubic hair was present; the genitalia were puerile.

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3. McBride, E. D.: Congenital Deficiency of Clavicle; Hereditary Cleido-Cranial Dysostosis, J. Bone & Joint Surg. **9**:545 (July) 1927.

4. Cocker, A. B., and Sims, H. S.: A Case of Cleido-Cranial Dysostosis, Lancet **1**:595, 1923.

5. McCurdy, I. J., and Baer, R. W.: Hereditary Cleido-Cranial Dysostosis, J. A. M. A. **81**:9 (July 7) 1923.

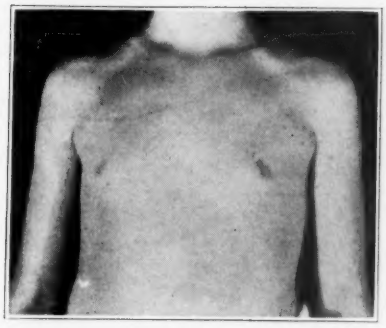

Fig. 1.—Prominence over the midportion of each clavicle.

Fig. 2.—Shoulders easily approximated.

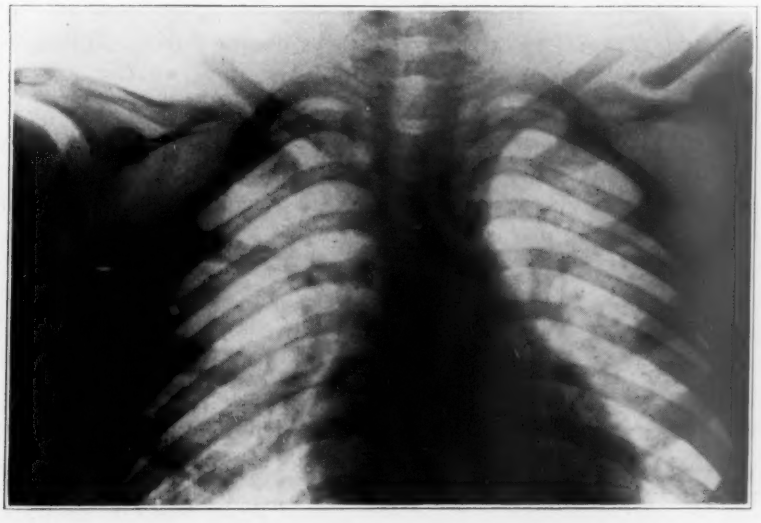

Fig. 3.—Symmetrical nature of the clavicular lesion. The calcified nodule can be seen more distinctly on the left side.

No other bony deformities were present, with the possible exception of tapering fingers.

History revealed the patient to be the second child delivered normally without the use of forceps. The labor was neither dry nor unduly protracted. The first teeth appeared at 5 months of age, and there had been no delay in dentition. The anterior fontanel closed after the second year of life. The mother stated that closure occurred much later than in her first child. She also noticed that the patient's head was larger than his brother's. There was no history of trauma. Neither parent was aware of any abnormality or deformity in the child. The condition of the clavicles had never been pointed out to them.

Examination of the older brother and of both parents of the patient failed to reveal any clavicular abnormality. Fluoroscopic examination showed that both portions of each clavicle were entirely separated. Motion was slightly restricted. This restriction was attributed to a loose fibrous union of both segments.

Roentgen Examination.—The following points were noted on roentgen examination:

1. A bilateral, symmetrical separation of both clavicles was present at approximately the same point, corresponding to the deltoid tubercle.

2. The lateral end of the sternal portions were rounded and directed upward and anteriorly.

3. The acromial portions were directed downward and posteriorly. The medial end of each acromial portion was also rounded and smooth.

4. At about 0.5 cm. from the medial end of each acromial portion was a small, calcified nodule. On fluoroscopic examination this was found to be united to the acromial portion. The calcified nodule was of the same size on both sides.

5. The sum of the length of the medial portion (6.5 cm.) and the lateral portion (5.5 cm.) corresponded to the length of a normal clavicle for a child of that age.

6. Excepting the break in continuity of both clavicles no pathologic condition of the bones of the vertebrae or ribs was present.

COMMENT

The development and ossification of the human clavicle, as described by Fawcett,[6] offer ready explanation of the clavicular deformity found not only in our case, but also in others described in the literature. Fawcett [6] described the development as starting in an embryo of 11 mm., as a condensed, curved rod of connective tissue extending from the acronium toward the first rib. As the embryo grows (at 15 mm.), there are laid down within this connective tissue an inner and an outer mass of precartilage. The inner mass is above and anterior to the outer mass, though they are separated from each other by connective tissue. At 17 mm., each precartilaginous mass independently becomes ossified at the center, without the appearance of any cartilage cells. A cross-section reveals a center undergoing ossification, surrounded by a layer of precartilage, which in turn is covered by a dense connective tissue. At from 18 to 19 mm., the two masses of precartilage (each containing a

6. Fawcett: Development and Ossification of the Human Clavicle, J. Anat. & Physiol. **47**:225, 1912-1913.

center of ossification) fuse by their approximate ends. Within this precartilaginous bridge, a separate center of ossification arises, which unites the two previously separated centers. Pari passu, growth has occurred from the medial side of the inner mass and from the lateral side of the outer mass.

The growth, which at first consists of ossification of the precartilaginous tissue, later continues by chondrification of the unossified precartilage. Cartilage cells appear first in the outer segment (at 27 mm.). After this stage, the bone is formed at the expense of the cartilage and also from the investing periosteum.

Thus the clavicle may be considered to arise from two centers of ossification, at first developing from the investing membrane and subsequently also from the chondrified connective tissue. These two centers subsequently become united by the development of a third center lying between the two. This third center grows entirely from the membrane, no cartilage cells being present.

In the case presented, the embryologic interpretation may well be that development from both sternal and acromial centers has proceeded to completion, whereas the third connecting center has failed to unify them. Thus the small calcified area may represent this third center of ossification. This, however, in no way tends to explain the reason for the lack of fusion. According to another explanation, the small calcified nodule may represent a small sesamoid bone lying in the fibrous connection extending between both segments of each clavicle.

The important feature in the various clavicular deformities reported is not whether the abnormal portion has developed from cartilage or from membrane, but rather the actual absence or retarded development of the sternal, acromial or intermediate center of ossification. Absence of either half of the clavicle may be interpreted as failure in the development of the center of ossification for that side.

The possibility of fracture was considered in our case, but ruled out for the following reasons: (1) no history of trauma either at birth or subsequently, (2) the symmetrical nature of the lesion, (3) the rarity of intra-uterine fracture, especially of bilateral, symmetrical fracture, (4) lack of union and (5) absence of callous formation.

Several theories have been advanced to explain the syndrome. One deals with the occurrence of amniotic bands as the cause of the congenital absence or anomaly of various bones. Féré and Papin [7] suggest that the clavicular deformity may be produced by intra-uterine muscular convulsions of the fetus. Insufficiency of the germ plasm has also been suggested.

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7. Féré, C., and Papin, E.: Fractures symétriques et ignorées des clavicles, Rev. de chir., Paris **22**:294, 1902.

CONCLUSION

The case presented shows primarily a bilaterally symmetrical cleidal dysostosis. Although it does not fulfil all of the criteria pointed out by Marie and Sainton,[8] the prominence of the forehead, the tapering fingers and the history of delayed closure of the anterior fontanel point to other bony deformities. There is no history of heredity. Furthermore, the presence of the calcified nodule at the medial end of each acromial segment suggests that all these cases deal primarily with some unknown force which interferes with the ossification centers of the clavicle. The dermal and chondral origin of the bone is possibly a secondary consideration.

8. Marie, Pierre, and Sainton, Paul: Sur la dysostose cleido-crannienne héréditaire, Rev. neurol. **6**:835, 1898; footnote 1.

MULTIPLE INTRACRANIAL TUMORS IN CHILDREN

SUPRASELLAR ADAMANTINOMA ASSOCIATED WITH CEREBRAL GLIOMA

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During the past twenty years, it has become progressively more evident that cerebral new growths are not a rarity, but that they are relatively common in neuropediatric practice. Those aware of their occurrence are frequently of the opinion that in the majority of cases they are malignant and inoperable, but with the advance of special surgical technic, the increase in the knowledge of the life history of the lesions and the sharpening of diagnostic acumen the percentage of successes in operations on the brain is rapidly increasing.

If the clinical diagnosis of a single cerebral tumor is often difficult, that of multiple intracranial tumors is impossible in the majority of cases. While the presence of these tumors may be suspected when there are definite indications of disease in different parts of the brain, in the reported cases the correct diagnosis was seldom made before operation or autopsy.

The following case of suprasellar adamantinoma coexistent with cerebral glioma that we have seen in a young child illustrates the difficulty encountered in the diagnosis of multiple tumors of the brain.

REPORT OF CASE

R. B., a boy, 5½ years old, had been under our care at intrevals for three years and was seen last ten months before admission to St. Francis Hospital. The family history was free from hereditary disease. His development had been normal, mentally and physically. There had been no severe illnesses, accidents or injuries. Late in June, 1930, the mother noticed that the boy held objects close to his face when looking at them. He was taken to an oculist, who could find nothing abnormal in the fundi, except a questionable paleness. It was noticed that objects held to the right of the midline failed to attract the child's attention as well as those on the left. There was no headache, vomiting, dizziness or staggering, although he walked cautiously, on account of poor vision. Physical examination otherwise gave negative results as to reflexes, equilibrium, heart, lungs, ears, throat, blood, urine and general physical development.

From the Children's Clinic and the Pathological Department of St. Francis Hospital.

The boy was referred to Dr. Weiner and Dr. Sachs of St. Louis. As the latter was out of the city, Dr. Klemme saw him, and the examination made by the two physicians showed no alteration in the cutaneous sensations and no signs of involvement in the pyramidal system. Neurologic examination gave negative results except that vision in the right eye was almost gone. The patient could distinguish large objects and could tell when objects, such as an orange, were moved. In the left eye, perimetry revealed nasal vision to be gone. Stereoscopic roentgenograms of the skull showed evidence of pressure; the sella appeared to be within normal limits and to be bridged with bone (fig. 1). Because of lack of localizing signs,

Fig. 1.—Roentgenogram of the skull. The sella is within normal limits. No suprasellar calcified areas are visible.

an injection of air was made which revealed a thinning out of the left lateral ventricle in the lateral view and a pushing of the left lateral ventricle and of the third ventricle to the right in the anteroposterior view (fig. 2). It was concluded that the lesion was deep-seated in the left parietal lobe. On the next day the patient was listless, and a definite right facial weakness of the central type was noted which seemed to indicate also a left parietofrontal lesion. On August 27, Dr. Klemme operated, making a large flap over the left parietal region with the center of the flap over the motor cortex. No tumor was found in the suspected region, but during exploratory aspiration with the ventricular needle a large cyst was encountered through the parietal lobe, at a depth of about 9 cm., and approxi-

mately 75 cc. of yellow fluid was removed which did not coagulate. No cholesterol crystals were found in the fluid.

The child made an uneventful recovery. In ten days, the left nasal defect cleared completely, and he was able to count fingers at a distance of 18 inches (45.7 cm.) with the right eye. It was decided to attempt nothing further at this time, and the boy was sent home, to return later for examination and possibly further operation. He was seen by the two oculists who had previously examined him, and his sight was pronounced normal. He remained well for two months and was seen on two occasions, apparently in perfect condition, except for a slight fulness over the site of the operation.

Fig. 2.—Anteroposterior view after injection of air. The left lateral ventricle and the third ventricle appear pushed to the right.

Late in the evening of November 24, he complained to his mother of an earache on the left side. The temperature was 100 F. by mouth. At 4 o'clock the next morning, he had convulsions, vomited and had a high temperature. He was brought to the hospital in a convulsion which involved the entire right side of the body. The temperature was 106 F.; the left side of the head, at the site of the operation, was very tense. Intravenous injections of dextrose were given, and intramuscular injections of magnesium sulphate. The convulsive seizure was relieved, but the child remained tense and unconscious; the temperature was 104 F., the pulse rate 144 and the respiratory rate 48. The pupils were dilated during the seizures; they then became small and reacted to light. General examination revealed nothing except a slight cardiac enlargement, scattered râles throughout the chest and a moderately distended abdomen. The skin was somewhat cyanotic;

there were constant contractions of the right hand. The patient grew worse rapidly; the temperature rose to 106.6 F., and death occurred at 3:20 p. m. on the same day.

Necropsy.—Examination was made two hours after death, after embalming. It was limited to the head. The body was that of a well nourished boy apparently 6 years of age. The skin was of smooth texture, and there was more than the normal amount of subcutaneous fat. The pupils were regular and equal. The sclerae were clear. The nose and ears were not abnormal, and the teeth were in good condition. The external genitalia were normal.

In the left parietotemporal region of the head, a well healed semicircular scar surrounded a bulging area, about 3 cm. in diameter and 1 cm. high. The covering

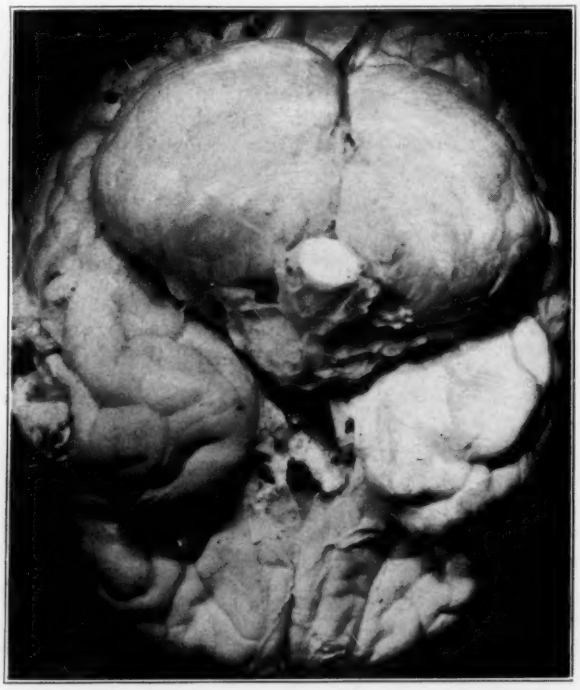

Fig 3.—Basis of the brain. The ruptured suprasellar cyst is attached to the tuber cinereum, chiasm of the optic nerves and posterior part of the frontal gyri recti.

skin was intact and without inflammatory changes. The removal of the brain was accomplished with difficulty, owing to firm adhesions of the meninges, especially in the left hemisphere. At the site of the craniotomy skin and muscle had to be severed from the underlying brain by sharp dissection, and about 10 cc. of straw-colored, thin fluid escaped from the cortex of the left temporal lobe. The surface of the hemispheres showed marked flattening and widening of the convolutions. The pia was edematous and cloudy, especially over the sulci. At the time of lifting the brain from the base, a cyst in the chiasmatic region ruptured, and about 12 cc. of a cloudy thin fluid escaped. The lower portion of the cyst wall was attached to the base of the skull (fig. 3).

The suprasellar, irregular cyst measured 3 cm. in its sagittal, and 2.5 cm. in its transverse, diameter. Its depth was 1.5 cm. The thickness of the cyst wall varied from 1 to 6 mm., owing to many granular excrescences on its inner surface, many of which had small granules, apparently calcified. The tumor was united to the anterior surface of the infundibulum, on the upper side of which it seemed to arise and had the greatest thickness (fig. 4). It pressed backward and upward on the anterior half of the floor of the third ventricle, but at no point had the tumor broken through the floor of the ventricle. The cyst wall was adherent to the anterior part of the tuber cinereum, and farther forward it lay beneath and pushed upward the gyri recti of the frontal lobes. Both optic nerves appeared flattened, owing to pressure of the tumor from below. Separate from the growth, the hypophysis was markedly flattened from above downward, but otherwise it was of normal appearance, and the pituitary fossa was intact. The brain was

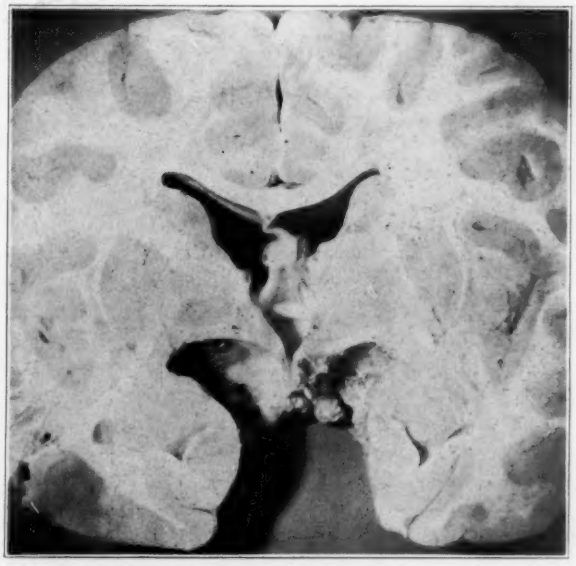

Fig. 4.—Coronal section through the chiasm. The calcified excrescences of the cyst wall are plainly seen, especially on the right side of the tuber cinereum. There is dilatation of the lateral and third ventricles.

heavy, weighing 1,800 Gm. The large sinuses were free from antemortem thrombi, and the accessory sinuses and mastoid cells did not show inflammatory changes.

After hardening of the brain for several days in a 10 per cent solution of formaldehyde, numerous coronal sections were made, which revealed the presence of a cyst occupying the middle part of the left upper temporal gyrus. It extended from the cortex, close to the inferior horn of the left lateral ventricle, as seen in figure 5. The cyst measured 3 cm. in its transverse diameter and 2 cm. antero-posteriorly, and its depth was 1 cm. The interior surface was lined with a ragged, yellowish layer of tissue. At the time of autopsy, its content, about 10 cc. of thin yellow fluid, had escaped through a rupture of the covering cortex, when the muscle had to be separated from the brain in the craniotomy opening of the skull by sharp dissection. The left ventricle and the third ventricle were displaced

slightly to the right, and all the ventricles were dilated and filled with a thin, cloudy fluid. The gross appearance of the cyst and its location just beneath the craniotomy opening suggested an old abscess.

Microscopic Examination of the Suprasellar Cyst: The cyst was composed of a varyingly thick, fibrous wall, having a lining of stratified squamous epithelium. The basal layer consisted of columnar elements, while higher the epithelial cells were more and more flattened. No intercellular bridges and no horny layers were found. For the most part, this stratified epithelium was composed of only a few layers, but in some places flat, down-extending epithelial processes were present. The warty excrescences of the cyst wall showed a much more complicated histologic structure. Sections of a block from the right tuber cinereum (figs. 6 and 7) revealed epithelial masses made up of branching and interlacing columns, which were also, in the main, solid structures. These were composed of a distinct cell arrangement. The basal or peripheral cells were long, slender and columnar, each

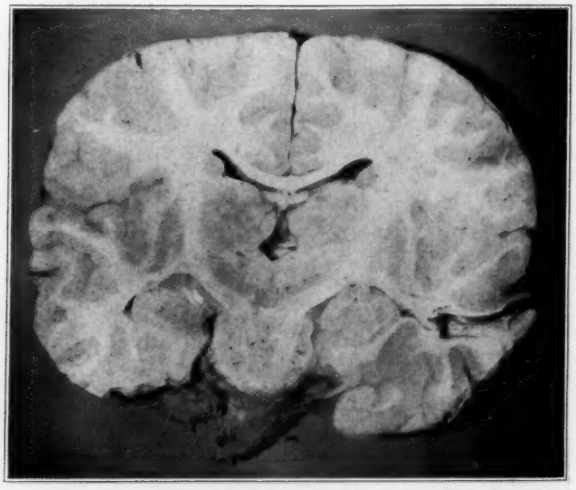

Fig. 5.—Coronal section through the pons. There is a cystic tumor in the left temporal lobe. The lateral wall of the gliomatous cyst ruptured at the time of autopsy.

one being in close contact with its neighbor (palisade formation). There was a single row of these cells. The nuclei were oval, darkly staining and situated in the center of the protoplasm, and there were well defined nucleoli. These cells corresponded in structure and arrangement with the ameloblastic cells found in adamantinoma of the jaw. Immediately beneath the ameloblastic layer, there was an intermediate zone comprising two or three rows of cells. These cells were rounded or polygonal, and the nuclei were well defined but stained less darkly than in the ameloblasts. In some places there was a tendency toward a whorled arrangement of the intermediate cells, and concentric layered epithelial nodules were not infrequent, but in only one of them was keratinization noted. Innermost lay the main cell system of the epithelial masses. These cells formed triangular or prismatic-shaped structures. The nuclei were small in relation to the amount of protoplasm, and thin cell processes stretched out and joined similar ones of adjacent cells, often resulting in a stellate appearance of such individual cells.

There was a close analogy between these cells and those of the stellate reticulum of the enamel organ.

Characteristic cysts were found within the epithelial masses. They were of different size and apparently of two different origins. Small oval or round lacunae lying between the individual cells of the inner mass contained a red-stained, homogeneous, colloid-like material. The larger cysts had an irregular crenated wall and papillary projections intruding into the center of the cysts. Their lumens were

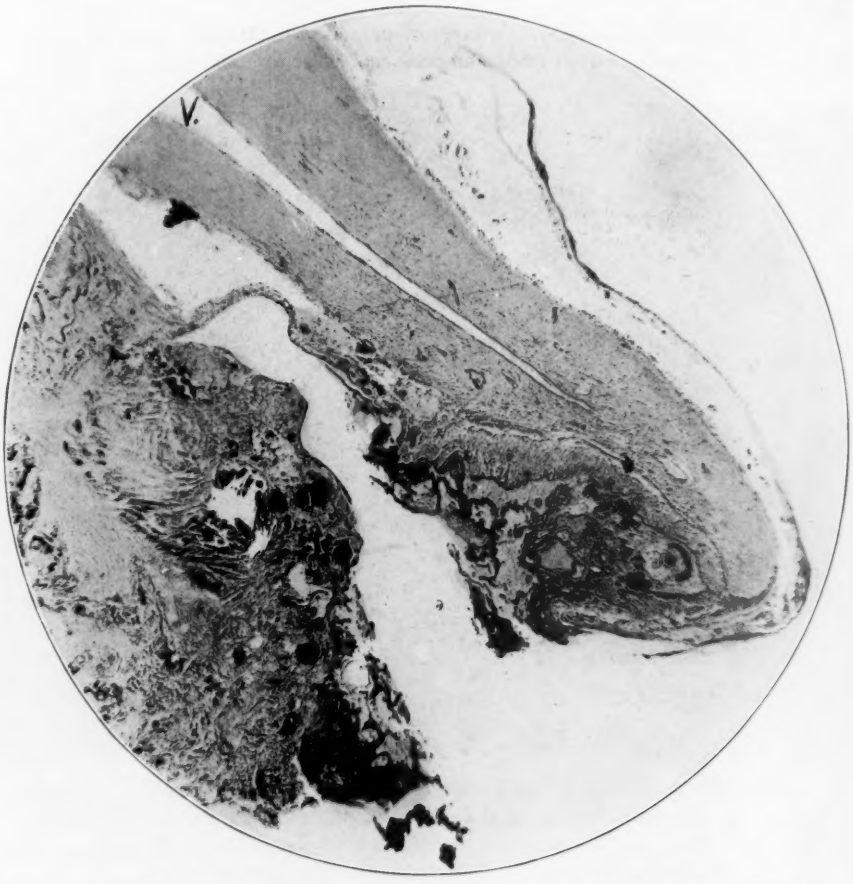

Fig. 6.—Microscopic section (low power) of the tumor mass on the right tuber cinereum. There are calcified dark areas and shaftlike clear spaces of cholesterol. The epithelial tumor masses have not broken through the wall of the third ventricle (V).

filled with pale, granular, muco-albuminous fluid or appeared empty. The lining membrane was composed of a single layer of square or columnar cells, resembling ameloblastic cells. The stroma was made up of strands of fibrocytes, which ran in a direction tangential to the epithelial masses. The fibrils were arranged in no definite order and appeared as a loose, interlacing network. Large areas of myxomatous substance were formed by coalescence of smaller clumps of necrotic

epithelial cells. Many of the cells exhibited lipoid changes, leading to liberation of crystals of cholesterol. In the paraffin sections, they appeared as shaftlike, clear spaces, due to the dissolving of the fatty substance (fig. 6). Sections of the right optic nerve showed a different variation of the epithelial structure. Here the tumor mass covering the nerve sheath was made up largely of nests or processes of necrotic, red-stained, stratified epithelium in which a varying amount of calcification had occurred. No true formation of bone was present. Lying in lacunae, formed in the periphery of dead tissue, were large, irregular-shaped foreign body giant cells.

The hypophyseal sections were grossly of normal size, although somewhat flattened. The sections contained both anterior and posterior lobes. There seemed

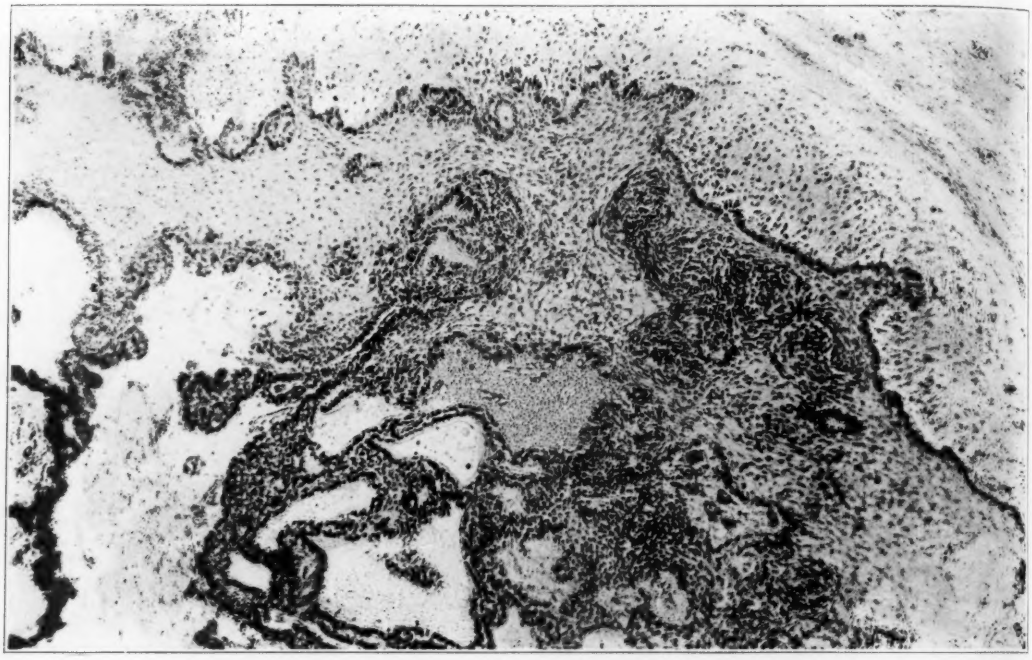

Fig. 7.—Photomicrograph (higher magnification) of area shown in figure 5. The palisade formation of the peripheral cells, the whorled arrangement of the intermediate cell layer and the stellate cells are characteristic of adamantinoma. Many cysts, most of them lined with ameloblastic cells, are present.

to be a slight increase in eosinophilic elements throughout the anterior lobe, while chromophil and basophil cells were relatively few. The pars intermedia showed only a few rather small tubules, filled with colloid. No large colloidal cysts were present. There was a marked leukocytic infiltration of the peripheral upper area of the anterior lobe.

Microscopic Examination of the Cystic Tumor in the Left Temporal Lobe: Examination did not confirm the suspicion, held at autopsy, that the tumor in the left temporal lobe was an abscess. No inflammatory changes were noted in the cyst wall. The wall was composed of neoplastic tissue, the most characteristic elements of which were large cells of the astrocyte type. They were large, variable

in size and polygonal. Coarse glial fibrils, which stained well with Mallory's phototungstic acid hematoxylin, stretched out from the protoplasm of the astrocytes, and with similar fibrils from other glia cells made up the stroma. In the delicate loose network, the glia cells appeared almost isolated from one another over large areas. The large astrocytes had an abundant, rather homogeneous, opaque cytoplasm which was very acidophilic; the nucleus was generally round or oval and mostly vesicular and had a prominent nucleolus. Mitotic figures were not seen in these cells. In many areas in which the astrocytes were numerous and the capillaries infrequent, clear cystic spaces were present, illustrative of the tendency of the tumor to cystic degeneration. The tumor elements shaded gradually into the cerebral tissue. The surrounding dense gliosis of the brain tissue added to the difficulty of defining the exact limits of the neoplastic process.

Microscopic examination of the surface of the brain and of the medulla showed marked edema and leukocytic infiltration of the subarachnoid space. In the sediment of the ventricular fluid, many leukocytes and many encapsulated, lancet-shaped diplococci were found, which stained with Gram's method.

Pathologic-Anatomic Diagnosis: The diagnosis was suprasellar adamantinoma, cystic astrocytoma of the left temporal lobe and acute pneumococcic meningitis.

COMMENT

There are comparatively few data available in the literature concerning the relative frequency of tumors of the brain in children as compared with those in adults. Among 350 records of cases of verified cerebral tumors in the services of the Philadelphia Hospitals, Leavitt [1] discovered reports of 23 cases occurring in children, in 15 of which the tumor was situated in the cerebellum; there were 3 cerebral gliomas, 1 cyst of the cerebellopontile angle, 1 spongioblastoma of the pineal gland, 1 metastatic sarcoma, 1 pontile glioma, 1 suprasellar cyst and 2 tuberculomas. The proportion of juvenile to adult patients in Leavitt's series was about 1 to 14.

Cushing [2] stated that of 1,108 verified tumors of the brain only 154 were diagnosed in preadolescence, his opinion concerning this small proportion being that many more tumors are unrecognized in children than in adults. The ratio in his much larger series of cases is approximately 1 to 7. From a review of his vast number of cases, Cushing found that the types of tumors seen in children differ from those occurring in adults. In his total of 154 juvenile cases, there were 116 of glioma, 21 of congenital tumors and 2 of pituitary adenoma. His findings are also of interest in that in children the predominating site for formation of tumors was in the cerebellum, 85 of the 154 growths being in that location, as compared to 44 in the cerebrum. His proportion of cerebellar growths is essentially the same as in Leavitt's series.

1. Leavitt, F. H.: Brain Tumors in Childhood, Am. J. M. Sc. **178**:229, 1929.
2. Cushing, H.: The Intracranial Tumors of Preadolescence, Am. J. Dis. Child. **33**:551 (April) 1927.

Davis [3] observed 14 intracranial tumors in patients under 15 years of age, and 11 of these were cerebellar gliomas. Besides the various types of gliomas, the congenital tumors, such as suprasellar cysts, made up the majority of brain tumors occurring in childhood.

None of these three authors mentioned the simultaneous occurrence of two or more intracranial tumors in children, while in adult life this does not seem to be particlarly rare. Recently Hosoi [4] reviewed in an exhaustive study the cases of multiple glioma from the literature and added the report of a case observed by himself in a 44 year old man. Bailey and Cushing,[5] in their analysis of 378 cases of verified glioma, observed 2 examples of double tumors of the glioma series. In 1871, Edes [6] reported a case of two gliomas in the parietal and occipital lobes. Bradley,[7] in 1880, described a case of gliomas in the right side of the cerebellum and in the left cerebral hemisphere. In 1895, Stroebe [8] reported the occurrence of a large glioma of the right occipital lobe and a smaller tumor nodule under the cortex of the anterior part of the paracentral convolution. Among 127 verified cases of glioma, Tooth [9] found a case of multiple gliomas, one in each frontal lobe, and another in which a single occipital glioma was associated with an angiosarcoma of the right marginal hemisphere. In a pathologic study of 40 intracranial tumors, Greenfield [10] reported a case of multiple gliomas of the intracranial nerve roots. Giannuli [11] described a glioma of the right parietal lobe and of the pons. In Freeman's [12] case, three gliomas were located in the left frontal lobe, in the genu of the corpus callosum and in the left frontal operculum. In a total of about 51 gliomas, Purves-

3. Davis, L.: Intracranial Tumors of Childhood, Wisconsin M. J. **29**:429, 1930.

4. Hosoi, K.: Multiple Gliomas of the Brain, Arch. Neurol. & Psychiat. **24**: 311 (Aug.) 1930.

5. Bailey, P., and Cushing, H.: A Classification of the Tumors of the Glioma Group on a Histogenetic Basis with a Correlated Study of Prognosis, Philadelphia, J. B. Lippincott Company, 1926.

6. Edes, R. T.: Morbid Growths Connected with the Nervous System, Am. J. M. Sc. **61**:87, 1871.

7. Bradley, W. L.: Case of Glio-Sarcomatous Tumors of the Cerebrum and Cerebellum, Proc. Connecticut M. Soc. **2**:39, 1880.

8. Stroebe, H.: Ueber Entstehung und Bau der Gehirngliome, Beitr. z. path. Anat. u. z. allg. Path. **18**:405, 1895.

9. Tooth, H. H.: Some Observations on the Growth and Survival Period of Intracranial Tumors Based on the Records of 500 Cases with Special Reference to the Pathology of the Gliomata, Brain **35**:61, 1912.

10. Greenfield, J. G.: The Pathological Examination of Forty Intracranial Neoplasms, Brain **42**:29, 1919.

11. Giannuli, F.: Glioma de parieto-pontino dell' emisfero cerebrale destro, Policlinico (sez. med.) **33**:281, 1926.

12. Freeman, W.: Reactive Gliosis in a Case of Brain Tumor, Arch. Neurol. & Psychiat. **14**:649 (Nov.) 1925.

Stewart [13] found two separate gliomas in one brain, symmetrically situated in each cerebral hemisphere. Bassoe [14] observed a unique case of two large tumors at opposite ends of the brain, one in the fourth ventricle and the other in the frontal lobe, both having the structure of primary ependymoma. While Hosoi regarded these multiple gliomas as of multicentric origin, and not due to a metastatic process, the possibility of one being an implantation or a regional metastasis of the other cannot be absolutely denied. Borst [15] stated that multiple occurrences of gliomas have not been observed with certainty, at least so far as genuine tumor-like proliferation of the glia is concerned. Only in cases in which both intracranial tumors are definitely of different histologic structure is their independent origin not subject to doubt. Reports of such instances are not numerous in the literature. Behrendsen [16] observed a case of cholesteatoma of the pia mater, in the region of the pons, associated with a glioma of the left hemisphere. Bartels [17] reported a case of multiple sarcomas of the meninges and another of endothelioma and neurofibroma of the base. Stromeyer [18] described a case of primary sarcoma and cholesteatoma. Sands [19] found at autopsy in a man of 43 an endothelioma and an angioma in one frontal lobe. Hunt [20] reported multiple tumors of the brain in 2 young patients. The first was a boy of 7 years, who had a glioma occupying the left optic thalamus and a large congenital cyst in the fourth ventricle. The other, a youth of 17, had a tumor in the right crus cerebri and also a cystic growth attached firmly to the floor of the fourth ventricle. Almeida Dias [21] found at autopsy in an 8 year old boy a large pinealoma associated with numerous gliomatous nodules in the base of the brain, and in Hosoi's [22] case multiple intracranial angiomas were coexistent with multiple meningiomas.

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13. Purves-Stewart, J.: Intracranial Tumors and Some Errors in Their Diagnosis, London, Oxford University Press, 1927, p. 266.

14. Bassoe, P.: Multiple Ependymal Glioma, Arch. Int. Med. **2**:194 (Sept.) 1908.

15. Borst, M.: Die Lehre von den Geschwuelsten, Wiesbaden, J. F. Bergmann, 1902, p. 254.

16. Behrendsen, V.: Ein Fall von gleichzeitigem Auftreten zweier verschiedenartigen Hirntumoren, Deutsche med. Wchnschr. **25**:710, 1899.

17. Bartels, J., cited by Sands.[19]

18. Stromeyer, F.: Ueber ein mit Sarkom combiniertes Cholesteatom des Gehirns, Beitr. z. path. Anat. u. z. allg. Path. **47**:391, 1910.

19. Sands, I. J.: Multiple Primary Cerebral Neoplasms: Report of a Case, Arch. Neurol. & Psychiat. **16**:447 (Oct.) 1926.

20. Hunt, J. R.: Two Cases of Congenital Cyst of the Fourth Ventricle Associated with Brain Tumor, Proc. New York Neurol. Soc. **31**:329, 1904.

21. Almeida Dias, A.: Ueber einen Pinealtumor mit multiplen Gliomen, Monatschr. f. Psychiat. u. Neurol. **76**:9, 1930.

22. Hosoi, K.: Multiple Intracranial Angiomas, Am. J. Path. **6**:235, 1930.

There is general agreement that it is extremely difficult to describe any clinical symptoms capable of serving in the diagnosis of multiple, intracranial tumors. It might be supposed that if one tumor often produces intracranial hypertension association of two or more would show still greater intracranial pressure. But a study of most of the reported cases discloses the fact that the syndrome of intracranial hypertension is often absent, or occurs very late. Our own case did not present choked disk, in spite of repeated examinations of the eyes by different capable observers. The clinical diagnosis of multiple tumors of the brain must depend on signs of localization, but this is also very difficult, for, according to Roger and Albert-Cremieux,[23] certain single cerebral tumors may show symptoms at a distance that may give the impression of a second tumor, and, on the other hand, double or multiple tumors may be manifested only by a series of symptoms capable of being explained by a single tumor. In addition, in spite of the fact that certain double or triple tumors are very large, there may be absolutely no focal symptoms until the terminal stage.

From the diagnostic standpoint our case presents most interesting features. By neurologic examination and roentgenograms the tumor in the left temporal lobe was well localized. The slight facial paralysis and the displacement of the ventricles to the right pointed clearly to the left parietotemporal region, and the craniotomy was performed exactly at the site of the lesion. The hypophyseal cyst, on the other hand, was not recognized until by aspiration fluid was obtained from the suprasellar region. The fact that the adamantinomas are so prone to calcification is generally regarded as of the greatest clinical importance, because it is possible in about 85 per cent of suprasellar cysts to demonstrate calcified nodules in the roentgenogram. Anatomically the calcium deposits were so marked in our case that we cannot understand why they did not show in the roentgenograms. Furthermore, pressure on the chiasm by the suprasellar cyst was evidenced by a marked defect in vision. This sign, however, was not really typical in our case, because on the left side vision was impaired only in the nasal field, and the vision of the right eye was almost gone.

Taking careful retrospection of our case, after knowing the anatomic facts, we feel that there were enough clinical symptoms present to have made possible a correct diagnosis of both lesions during life, if the possibility of the simultaneous occurrence of two independent intracranial tumors had entered into our diagnostic considerations. Since astrocytoma and suprasellar adamantinoma are the most frequent intracranial tumors of preadolescence, their coexistence cannot be excluded.

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23. Roger, H., and Albert-Cremieux: Multiple Cerebral Tumors, Ann. de méd. **26**:5, 1926.

SUMMARY

A case of suprasellar adamantinoma associated with cerebral astrocytoma is reported with physical signs pointing chiefly to the left cerebral lesion. The suprasellar cyst was diagnosed after an exploratory aspiration. Death occurred three months later, owing to acute meningitis, apparently of hematogenous origin.

Progress in Pediatrics

BACILLUS PYOCYANEUS IN CHILDREN

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AND
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The early idea that Bacillus pyocyaneus was a harmless secondary invader was dispelled long ago by numerous clinicians, pathologists and bacteriologists, who clearly demonstrated its pathogenic properties. It is an established fact that this chromogenic organism is not only the cause of localized suppurative processes, but is often the sole agent of systemic infection and fatal septicemias. Isolation of this organism from the circulation during life and positive culture of the heart blood post mortem substantiate its pathogenic nature. While the pathogenicity of B. pyocyaneus is comparatively slight in adults, it may be particularly virulent in children, especially in infants. Fraenkel,[1] who published three classic monographs on infection due to B. pyocyaneus, made bacteriologic and pathologic investigation in twenty-six fatal cases, twenty-one of which were in children below the age of 2 years. Before we report a rapidly fatal case of septicemia due to B. pyocyaneus in a child, we shall review the literature relative to this infection in children.

INFECTIONS OF THE SKIN

B. pyocyaneus attacks the skin more frequently than any other part of the body, and in many instances serves as the portal of entry for fatal septicemias. There is hardly a case of pyocyaneus infection described in the literature in which there was not some involvement of the skin. Of the various cutaneous lesions relative to this infection, the deep necrotic ulcerations, first observed by Barker[2] and termed "ecthyma gangraenosum" by Hitschman and Kreibich,[3] are the most characteristic. These ulcerations exhibit a definite predilection for certain areas such as the anorectal and genital regions. One must

From the Pediatric Department of Mount Sinai Hospital.

1. Fraenkel, Eugen: Ueber Allgemeininfektion durch den Bacillus pyocyaneus, Virchows Arch. f. path. Anat. **183**:465, 1906; Ueber die Menschenpathogenität des Bacillus pyocyaneus, Ztschr. f. Hyg. u. Infektionskr. **72**:486, 1912; Weitere Untersuchungen über die Menschen pathogenität des Bacillus pyocyaneus, ibid, **84**:369, 1917.

2. Barker, L. F.: The Clinical Symptoms, Bacteriologic Finding, and Postmortem Appearance in Cases of Infection of the Human Being with the Bacillus Pyocyaneus, J. A. M. A. **29**:213 (Jan. 31) 1897.

3. Hitschman and Kreibich: Zur Pathogenese des Bacillus pyocyaneus und zur Aetiologie des Ekthyma gangraenosum, Wien. klin. Wchnschr. **10**:1093, 1897.

mention, however, the umbilical wound in the new-born, not only as the site of localized infection, but also as the focus of general septicemia. Wassermann [4] reported an epidemic of eleven cases of umbilical infection. B. pyocyaneus was isolated in all which were examined bacteriologically. Babes [5] recorded a case of septicemia which originated in the umbilicus. Fraenkel [1] reported a case of intestinal infection in which the umbilical vein was the portal of entry.

INFECTIONS OF THE EAR

The most common suppurative process in childhood is otitis media. In spite of the fact that the pediatrician as well as the general practitioner so frequently encounters this condition, he rarely suspects that the causative agent may be B. pyocyaneus. Bacteriologic studies, however, have demonstrated that B. pyocyaneus is not infrequently the sole causative agent or at least one of the bacteria present in purulent otitis media.

Babes,[5] investigating the pathogenicity of B. pyocyaneus, emphasized the important rôle played by this organism in infections of the middle ear. Chambers,[6] studying the bacteriology of purulent otitis media in fifty-eight children, obtained B. pyocyaneus six times in pure culture, twice with Streptococcus pyogenes and twice with Streptococcus pyogenes and Staphylococcus aureus. In a report of thirty-eight autopsies performed on children having otitis media, Kossel [7] reported B. pyocyaneus present three times, twice in pure culture; in these two cases the middle ear seemed to have been the primary focus for B. pyocyaneus septicemia. Blaxall,[8] Martha,[9] Rohrer,[10] and Funke [11] recorded instances in which B. pyocyaneus has been found in the discharging ears of children both in conjunction with Str. pyogenes and in pure cultures. Schlagenhaufer [12] cited a case of an 11 year old boy who

4. Wassermann, M.: Ueber eine epidemie-artig aufgetretene septische Nabel-Infection Neugeborener; ein Beweis für die Bacillus pyocyaneus beim Menschen, Virchows Arch. f. path. Anat. **165**:342, 1901.

5. Babes and Cornil: Les bacteries, ed. 3, Paris, Félix Alcan, 1890, p. 486.

6. Chambers, T. R.: Bacteriological Examination of Otitis Media Purulenta and Suppurative Mastoiditis, J. A. M. A. **35**:1405 (Dec. 1) 1900.

7. Kossel: Zur Frage der Pathogenität des Bacillus pyocyaneus für Menschen, Ztschr. f. Hyg. u. Infektionskr. **16**:368, 1894.

8. Blaxall, F. R.: A Bacteriological Investigation of the Suppurative Ear Discharge Occurring as a Complication in Scarlet Fever, Brit. M. J. **2**:116, 1894.

9. Martha: Deux cas d'otite moyenne purulente, Arch. de méd. exper. et d'anat. path. **4**:130, 1892.

10. Rohrer: Ueber die Pigmentbildung des Bacillus pyocyaneus, Centralbl. f. Bakt. (Abt. 1) **9**:327, 1892.

11. Funke: Bacteriology of Otitis Media, Am. Med. **2**:728, 1901.

12. Schlagenhaufer, F.: Ueber pyocyaneus Infektion nach Lumbalanästhesie, Centralbl. f. Bakt. (Abt. 1) **59**:385, 1911.

died in convulsions attendant on acute otitis media. Autopsy showed an abscess of the right temporal lobe and thrombophlebitis of the right sinus transversus and the right internal jugular vein; bacteriologic examination revealed B. pyocyaneus in pure culture. Kopetsky and Almour [13] recorded two cases in which B. pyocyaneus was found in wounds following mastoidectomy. In the first case the bacillus was first obtained in pure culture three months after the operation; in the second case the wound yielded only hemolytic streptococcus until a week later, when B. pyocyaneus was detected. In Fraenkel's [1] series, B. pyocyaneus was isolated from the ears in four cases.

INFECTIONS OF THE EYES

Pyocyaneus infection of the eyes is rare in children, because such lesions usually follow some industrial injury. The only case recorded in the literature is that of Derby.[14] In the patient, a 3 week old infant, swelling of both eyelids, with conjunctival injection and a mucopurulent discharge developed. Smears and blood cultures showed Staph. aureus and B. pyocyaneus.

INFECTIONS OF THE RESPIRATORY TRACT

B. pyocyaneus often infects the respiratory system. Stein,[15] studying the bacteriology of the respiratory tract, reported the finding of B. pyocyaneus in mixed culture in the lungs during life. Soltmann [16] cited the case of a boy, aged 13, who died after eight days of illness. B. pyocyaneus was isolated in pure culture from his lungs. Clarke [17] reported the case of a boy, aged 15, who suddenly became ill with a cough and fever. Autopsy performed after twenty-three days of illness revealed a greenish, odorless pus in the pleural cavity, small abscesses throughout the lung and scattered pneumonic consolidations. B. pyocyaneus was obtained from the blood and feces in pure culture during life, as well as from the pleural exudate and heart blood. In Fraenkel's [1] six cases of involvement of the respiratory tract, B. pyocyaneus was identified bacteriologically in cases in which there were pulmonary abscesses or pleural exudates. Dudden [18] recorded two cases of respira-

13. Kopetsky and Almour: Erysipelas Following Bacillus Pyocyaneus Infections in Mastoid Wounds, Am. J. Surg. **2**:589, 1927.

14. Derby: Bacillus Pyocyaneus Found in Case of Conjunctivitis, Am. J. Ophth. **12**:1, 1905.

15. Stein, A. E.: Zur Behandlung des Pyocyaneus- Eiterung; zugleich ein Beitrag zur Therapie mit ultravioletten Strahlen, Berl. klin. Wchnschr. **52**:433, 1915.

16. Soltmann, C.: Zur Lehre der Pathogenität der Bacillus Pyocyaneus, Deutsches Arch. f. klin. Med. **73**:650, 1902.

17. Clarke, J. M.: A Case of Acute Septicemia Due to Bacillus Pyocyaneus, Bristol Med.-Chir. J. **21**:4, 1913.

18. Dudden, E.: Ueber Ekthyma Gangraenosum, ein Beitrag zu der Pyocyaneuserkrankungen des Kindesalters, Jahrb. f. Kinderh. **48**:257, 1922.

tory infection in infants which were regarded as suspicious cases of pertussis. Bronchopneumonia, pleural exudates and ecthyma gangraenosum developed later in these cases. B. pyocyaneus was obtained in pure culture from the pleural exudate and from the cutaneous lesions.

INFECTIONS OF THE DIGESTIVE TRACT

The invasion of the gastro-intestinal tract by B. pyocyaneus is not of uncommon occurrence. The presence of this bacillus and its toxins produces paralysis of the smooth muscle and distention of the intestine. Several epidemics of summer diarrhea have been associated with it. Thus Cooley [19] reported the interesting occurrence in an institution of an epidemic of infantile diarrhea due to contamination of the feeding bottles with B. pyocyaneus. The epidemic, which involved thirty-seven children, resulted in nine deaths. Smears made from the stools showed B. pyocyaneus, but blood cultures were sterile. Escherich [20] described in detail four fatal cases of infantile diarrhea due to B. pyocyaneus. Baginsky [21] recorded two cases of infantile diarrhea, one of which was fatal and in which the blood cultures were positive for B. pyocyaneus. The stools of both showed the same organism in pure culture. In Lartigau's [22] report of an epidemic of diarrhea in which six children were involved, B. pyocyaneus was isolated from the dejecta of the patients. Three of the six cases were fatal. The source of the infection was traced to the drinking water supplied by wells harboring B. pyocyaneus. Czerny and Moser [23] discussed fully gastro-intestinal infection by this organism in nursing infants. Jakowski [24] and Wollstein [25] reported cases of ulcerative gastritis due to B. pyocyaneus. Lesage and Thiercelin [26] found B. pyocyaneus in the intestinal canal of nursing infants with fever. Dudden [18] recorded a case of infantile diarrhea in which B. pyocyaneus was cultured from the stomach and

19. Cooley, T. B.: Epidemic of Infantile Diarrhea Apparently Caused by Bacillus Pyocyaneus, J. A. M. A. **50**:607 (Feb. 22) 1908.

20. Escherich, T.: Pyocyaneusinfektionen bei Säuglingen, Centralbl. f. Bakt. (Abt. 1) **24**:117, 1899.

21. Baginsky, A.: Zur Bacillus pyocyaneus Infektion in kindlichen Alter, Centralbl. f. Bakt. (Abt. 1) **47**:427, 1908.

22. Lartigau, A. J.: The Bacillus Pyocyaneus as a Pathogenic Factor in Human Pathology, with the Report of Three Cases, Philadelphia M. J. **2**:562, 1898.

23. Czerny and Moser: Klinische Beobachtungen an magendarmkranken Kinder im Säuglingsalter, Jahrb. f. Kinderh. **38**:430, 1894.

24. Jakowski, M.: Study of Bacillus Pyocyaneus, Ztschr. f. Hyg. u. Infectionskr. **15**:474, 1893.

25. Wollstein, Martha: Ulcerative Gastritis and General Infection by Bacillus Pyocyaneus in Children, Arch. Pediat. **14**:760, 1897.

26. Lesage, A., and Thiercelin, E.: Étude bactériologique de l'infection gastro-intestinale aiguë chez les nourrissons, Rev. mens. de mal. d. enf. **12**:583, 1894.

later from an abscess of the liver. Waite [27] reported a case of a girl, aged 7 years, whose illness began with tenderness over McBurney's point. Later daily chills, high fever and diarrhea developed, with reddish-brown, liquid stools. Postmortem examination showed multiple abscesses of the liver from which a pure culture of B. pyocyaneus was isolated. Wassermann [4] recorded the occurrence of a similar case of gastro-intestinal disturbance with multiple abscesses of the liver due to the same organism in a child, aged 7 years. In the six cases of Fraenkel's [1] series in which the digestive tract was involved, multiple abscesses of the liver were frequently encountered.

INFECTION OF THE GENITO-URINARY TRACT

Motz [28] reported the case of a child who showed a cystitis of two years' duration which bacteriologically proved to be an infection due to B. pyocyaneus. Grulee and Bonar [29] recorded a case of pyocyaneus infection of the urine in the new-born. Fraenkel [1] described a case of pyelitis associated with pyocyaneus septicemia, but failed to mention the presence of the organism in the urine.

INFECTION OF THE MENINGES

Fraenkel [1] contended that the hematogenous infection of the meninges is of rare occurrence, but that invasion may take place from either the nasopharynx or the middle ear. He cited the isolation of B. pyocyaneus in a case of meningitis having its origin in the middle ear. Kossel [7] cultivated B. pyocyaneus from the pus of the meninges of a child, aged 6 weeks. It was obtained in pure culture from the pia and heart blood. As the bacillus was found in the pus from the discharge of the middle ear, it is probable that this was the portal of entry. Gaucherand and Pigeaud [30] reported a case of meningeal infection in a baby 3 days old. Lumbar puncture yielded a purulent fluid. Cerebrospinal fluid obtained from ventricular puncture, performed three weeks later because of manifest hydrocephalus, yielded a pure culture of B. pyocyaneus. Kliewe and Koch [31] recorded an instance of chronic pyocyaneus meningitis. Dudden [18] reported a case of spinal meningitis in which early lumbar punctures were sterile, but in which a definite growth of B.

27. Waite, H. H.: Contribution to the Study of Pyocyaneus Infection with the Report of Two Rare Cases, J. Infect. Dis. **5**:542, 1908.

28. Motz: Compt. rend. Soc. de biol. **3**:128, 1896.

29. Grulee, C. G., and Bonar, B. A.: Clinical Pediatrics, New York, D. Appleton and Company, 1926, vol. 3, p. 270.

30. Gaucherand and Pigeaud: Meningitis in a New Born Child. Fatal Case, Bull. Soc. d'obst. et de gynéc. **17**:74, 1928.

31. Kliewe and Koch: Pyocyaneus Meningitis, München. med. Wchnschr. **71**: 867, 1924.

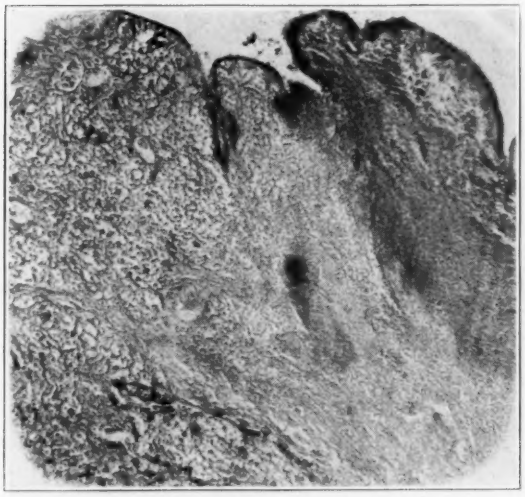

Fig. 1.—Gangrenous necrosis (primary lesion) of the rectum; very low magnification.

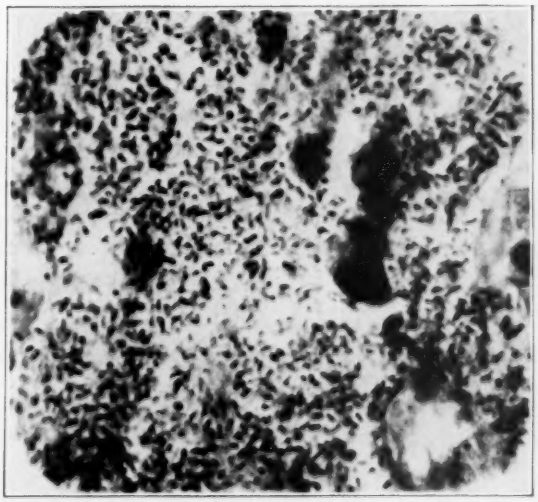

Fig. 2.—Colonization of B. pyocyaneus in gangrenous necrosis of the rectum; very high magnification.

pyocyaneus was later obtained. Benfey [32] related an instance of suppurative cerebrospinal meningitis accompanied by acute myelitis in which a pure culture of B. pyocyaneus of high virulence was found.

GENERAL SYSTEMIC INFECTIONS

No doubt can be entertained as to the pathogenicity and high virulence of B. pyocyaneus when it enters the blood stream. Baginsky [21] reported two cases of systemic infection in which the portal of entry was the middle ear. Charrin [33] recorded cases due to B. pyocyaneus septicemia in a brother and sister. Similarly, Ehlers [34] described two cases in a brother and sister who died of pyocyaneus sepsis. In these cases as in those of Charrin, the portal of entry appeared to be the

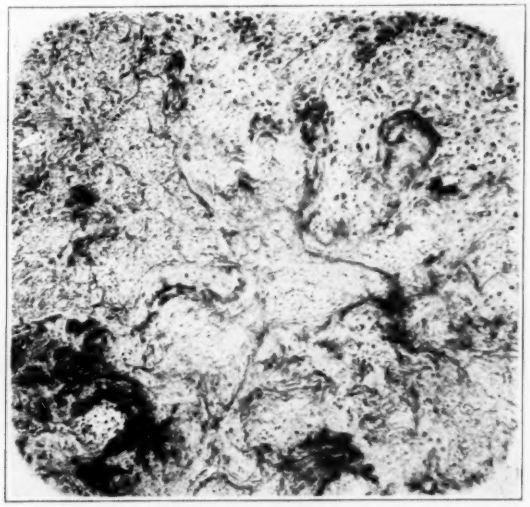

Fig. 3.—B. pyocyaneus due to embolic lesion in the lung, with necrosis and hemorrhage; low magnification.

gastro-intestinal tract. Finkelstein [35] reported three fatal cases in infants in which B. pyocyaneus was found in the heart blood post mortem. Hess [36] described a case of pyocyaneus septicemia in a girl, aged 3 years.

32. Benfey, A.: Ueber Pyocyaneussepis, Med. Klin. **3**:1199, 1907.

33. Charrin, A.: Maládie pyocyanique chez l'homme, Compt. rend. Soc. de biol. **2**:496, 1890.

34. Ehlers, E.: To tilfaelde af ecthyma gangraenosum (Ecthyma térébrant des enfants, Lailler og Fournier), maladie pyocyanique, hos mennesket, Hospitalstid. **8**:517, 1890.

35. Finkelstein, H.: Bacillus pyocyaneus und hemorrhagische Diasthese, Charité-Ann. **21**:346, 1896.

36. Hess, A. F.: A Case of Sepsis Due to Bacillus Pyocyaneus, Proc. New York Path. Soc. **60**:158, 1909.

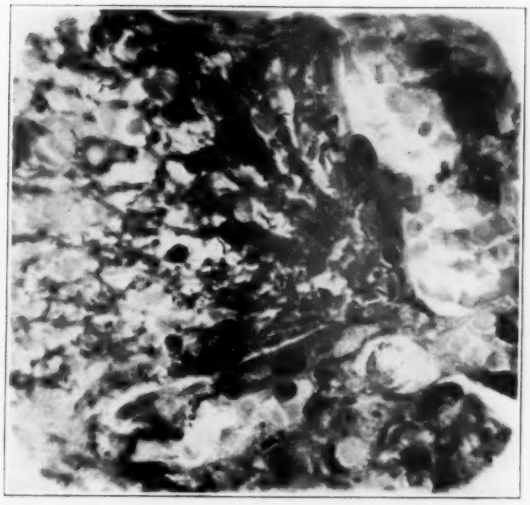

Fig. 4.—B. pyocyaneus colonization in embolic lesion of the lung; very high magnification.

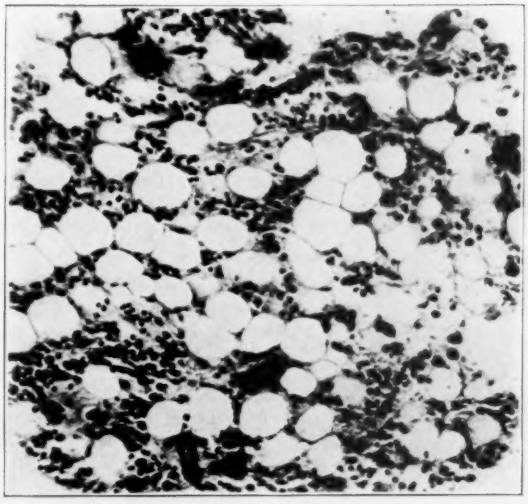

Fig. 5.—Myeloid cells fewer than normal in B. pyocyaneus infection of the rib marrow; high magnification.

Fraenkel,[1] Karlinski,[37] Perkins,[38] Blum,[39] Triboulet and Tolemer,[40] and Williams and Cameron [41] each reported instances of generalized systemic infection in infants.

INFECTIONS OF THE BONE

Septic arthritis is rarely met with in this form of infection; however, Groves [42] reported a case of septic hip joint due to B. pyocyaneus. Similarly, Wassermann [4] reported a case of arthritis of the knee joint requiring amputation.

The clinical and anatomic observations recorded in the literature may be best summarized in the words of Fraenkel [1] as follows:

1. The B. pyocyaneus is a dangerous, truly pathogenic bacillus, and not only exhibits local or general toxic effects but also invades the various organs of man.

2. Excepting the somewhat more frequent suppurative otitis media in small children caused by B. pyocyaneus, the lesions in the skin of children and adults known as ecthyma gangraenosum deserve special mention.

3. This cutaneous condition, of ectogenous origin in the majority of instances, can also under certain circumstances be an expression of a general infection of hematogenous origin. The differentiation is made by blood culture.

4. Next to the skin, it is especially the mucosa of the alimentary canal that is involved from the pharynx down; more particularly, the stomach may be affected and show extensive mucosal necroses. Involvement of the esophagus has not yet been established.

The rôle of the pyocyaneus as disease producer in many intestinal disorders with dysenteric manifestations, during which it is found with other bacteria in the stools, is not sufficiently established, owing to lack of anatomic, and especially histologic, findings in the intestines of such patients.

5. The mucous membrane of the eyes and respiratory tract can likewise be affected; the mucosa of the larynx and trachea may be involved in a way similar to that of the digestive tract, with the picture of circumscribed necroses; the lungs, in the form of hemorrhagic bronchopneumonia that macroscopically shows nothing characteristic.

6. Whether or not the involvement of the systems of organs mentioned is ectogenous or hematogenous in origin can be determined only in the individual case by blood culture.

7. In some cases of pyocaneus infection there are pathogonomonic lesions in the kidneys. These may be regarded certainly as expressions of a hematogenous pyocyaneus infection.

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37. Karlinski, J.: Sero-Therapy of Dysentery, Wien. klin. Wchnschr. **19:** 1550, 1906.

38. Perkins: Report of Nine Cases of Infection with Bacillus Pyocyaneus, J. M. Research **6:**281, 1901.

39. Blum, S.: Ein Fall von Pyocyaneus-Septikämie mit komplizierter Pyocyaneus-Endocarditis im Kindesalter, Centralbl. f. Bakt. (Abt. 1) **25:**113, 1899.

40. Triboulet and Tolemer: Ulcerations à Bacillus pyocyanique; Infection pyocyanique généralisée, Bull. Soc. anat. de Paris **72:**763, 1892.

41. Williams and Cameron: J. Path. & Bact. **3:**344, 1895.

42. Groves, E. H.: Clinical Lecture on a Case of Bacillus Pyocyaneus Pyaemia Successfully Treated with Vaccine, Brit. M. J. **1:**1169, 1909.

8. An ectogenous pyocyaneus infection of the kidneys can complicate surgical wounds of the kidney (pyelotomy).

9. There is also hematogenous inflammation of the meninges, apparently seldom observed.

10. The course of the great majority of pyocyaneus infections which have been described is acute and, almost without exception, fatal.

11. Chronic pyocyaneus infections have seldom been observed, and the prognosis in these cases is likewise considered serious.

12. The anatomic basis for all the organic changes of pyocyaneus infection is to be sought in a characteristic, typical colonization of the bacilli in the walls of the blood vessels in the diseased foci, and in the locally induced disturbance in nutrition increased by toxic influences.

This finding, even without the cultural identification of the bacilli, permits of an anatomic diagnosis of pyocyaneus infection.

13. In mucous membranes, the pyocyaneus bacilli at times penetrate into the mucous glands and cause necrosis of individual gland vesicles.

14. The therapy of pyocyaneus infection can be only expectant and symptomatic. The experiments to date with specific treatment by means of autovaccines have given no encouraging results.

AUTHORS' CASE

We report a rapidly fatal case of B. pyocyaneus infection, of eighteen days' duration, in a child with granulocytopenia.

History.—W. G., the first child of his parents, was born normally and weighed 9 pounds and 12 ounces (4,440 Gm.). He was breast fed for five weeks and then was given Eagle brand milk. The child gained weight steadily and progressed normally in every respect. The only contagious diseases he had had were chickenpox and whooping cough. At the age of 1 year an axillary abscess developed, and at the age of 5 years, an abscess near the rectum; thereafter he was subject to various minor cutaneous infections in the regions of the axillae and perineum.

On Sept. 19, 1928, two days prior to his admission to the hospital, he was sent home by the school nurse because of fever. The family physician was called in, and found the patient had a temperature of 104 F.; he complained of excruciating pain in the region of the rectum. Rectal examination was not attempted at that time, because of severe tenderness. He was referred to the hospital with a diagnosis of ischiorectal abscess.

Physical Examination.—The patient, aged 7 years, a well developed but considerably undernourished boy, appeared acutely ill and febrile, but he was conscious and fairly cooperative. He lay quietly on his back, with his thighs flexed on his abdomen, refusing to change his position because of extreme pain in the pelvic region. The head was normal in size and shape. There was no rigidity of the neck. The skin was dry, hot, pale and slightly icteric. There were a scar on the left arm and a few smaller cicatrices over the trunk and lower extremities—evidence of previous furunculosis. The pupils, which were equal and regular, reacted to light and in accommodation, and the ophthalmoscopic examination revealed numerous retinal hemorrhages. There were several carious teeth. The mouth was normal except for a few petechial hemorrhages on the mucous membrane of the right cheek. The ears were normal. The cervical glands were not enlarged. The chest showed considerable distention of the superficial veins. The percussion note was hyperresonant throughout, except for slight impairment over the left base; the breath sounds were diminished over this area. No râles were present. The heart was entirely normal, except for accentuation of the aortic

and pulmonic second sounds. The abdomen was somewhat distended and doughy. A firm spleen was felt two fingerbreadths below the costal margin, and the liver was palpable but not enlarged. The extremities and joints were normal, except for pain on extension of the lower limbs. Rectal examination although accompanied by extreme pain, gave negative results. The perineum was very tender, but no redness or swelling was apparent. Neurologic examination gave negative results.

Course.—The patient's temperature continued persistently high and was of a remittent type, varying between 103 and 106 F., with slight remissions in the morning. The toxicity and the prostration were pronounced and increased steadily during his stay in the hospital.

On Sept. 23, 1928, the heart showed marked precordial activity, with enlargement of the left border to two fingerbreadths to the left of the nipple line. A pericardial friction rub was heard at the third interspace to the left of the sternum; a faint systolic murmur was heard at the apex. Examination of the anorectal region showed a fissure and several external hemorrhoids.

An electrocardiogram showed a normal mechanism, slight right preponderance and a rate of 140.

The disks were poorly outlined, and the vessels engarged. Large, flame-shaped hemorrhages could be seen in the macular region.

A roentgenogram of the chest showed slight straightening of the middle left cardiac margin, with bulkiness of the ventricle. The pulmonary field showed considerable peritruncal infiltration throughout. There was no evidence of disease in the bony pelvis or spine.

On September 26, a blood transfusion was given.

On September 27, the pericardial friction disappeared, and the heart was enlarged to the right. No murmurs were heard. The abdomen was tender, distended and tympanitic, with dulness in both flanks. Fresh purpuric spots presented themselves over the left knee.

On September 28, a second blood transfusion was given.

On September 30, a rectal examination showed fulness of the entire pelvis, with no evidence of masses or of areas of fluctuation. There were induration and redness about the anal region, with some bulging in the left ischiorectal region.

On October 1, under gas anesthesia, exposure of the rectum disclosed a few gangrenous areas, which were partially removed. The bulging area to the left was incised, but no pus was obtained. Cultures taken from the gangrenous tissue yielded an abundant growth of B. pyocyaneus.

On October 2, the lungs showed infiltration of the right base posteriorly, and there was an increase in the cardiac dulness.

On October 5, the patient was comatose. The abdomen became more distended. Fresh purpuric spots appeared over the mid-dorsal and sacral regions. A fresh gangrenous area appeared in the mouth at the site of the lower bicuspid tooth. The scrotum and perineum became markedly swollen and were dark blue. A number of blebs containing bloody fluid appeared around the anus.

On October 6, the patient died.

Laboratory Findings.—Examination of the urine repeatedly gave negative results except for traces of albumin. A test with tuberculin, 1 : 1,000, given intradermally, was negative.

The results of a blood examination are shown in the accompanying table.

The platelet count was 55,000 on the fourth day after admission; it dropped to 15,000 two days before death. The bleeding time was six and one-half minutes, and the clotting time, four minutes. Widal tests in all dilutions were repeatedly

negative. The fragility test showed initial hemolysis at 0.4 per cent and complete hemolysis at 0.25 per cent. Blood cultures gave negative results on the patient's admission, but were positive for B. pyocyaneus on September 27. Stools were repeatedly negative for occult blood, but always yielded an abundant growth of B. pyocyaneus.

Postmortem Examination (Dr. A. M. Young).—Permission to examine the brain was not granted. The body was that of a well developed, poorly nourished white boy, aged 7 years. There were a number of subcutaneous hemorrhages on the trunk and extremities, the largest approximately 5 cm. in diameter. There were a few carious teeth in the lower jaw, surrounded by a gangrenous area covered with gray exudate. In the left buttock the tissue was necrotic and greenish-brown, and had a penetratingly foul odor. There was a recent surgical incision in the gangrenous area. There was considerable bluish-red discoloration about the anus, with a number of large blebs containing reddish fluid. The scrotum was swollen, edematous and bluish green.

There were many punctate hemorrhages scattered throughout the serous surfaces of the peritoneal cavity; these were especially numerous in the capsule of the liver, and there were a few in the pelvic cavity. These hemorrhagic areas

Results of Blood Count

	9/21/32	9/23/32	9/26/32	9/28/32	10/2/32	10/4/32
Red blood cells	2,100,000	2,190,000	2,090,000	1,590,000	1,450,000	1,740,000
White blood cells	3,200	4,800	4,200	1,150	2,400	1,600
Hemoglobin	55%	55%	45%	40%	60%	40%
Polymorphonuclears	35	40	38	8	10	4
Small lymphocytes	50	28	31	76	42	14
Large lymphocytes	9	19	17	14	0	0
Eosinophils	5	6	5	2	0	0
Transitionals	0	0	2	0	0	0
Endothelial cells	1	7	7	0	48	0
Disintegrated cells	..	..	..	..	..	82

measured from 1 to 4 mm. in diameter, and were irregular in outline and in places confluent. There was approximately 200 cc. of clear, straw-colored fluid in the abdominal cavity.

There were numerous hemorrhages of the visceral, parietal and diaphragmatic pleura similar to those involving the peritoneum.

The heart showed numerous subpericardial and subendocardial hemorrhages, in addition to a few small, scattered areas of hemorrhage in the myocardium, which was paler than the average and moderately diminished in consistence. On section of the lungs, scattered nodules about 1 cm. in diameter were observed. These solid patches were dark red, with a central gray area. In the left upper lobe there were several, very firm, gray, semitranslucent nodules. In the alimentary canal there were small scattered hemorrhages in the mucosa of the esophagus and stomach. In the region of the anus, the colon showed marked edema of the wall, with a greenish discoloration of the mucosa and a small area of ulceration covered by friable yellow exudate.

The muscles on the left side of the pelvis were swollen and a dark reddish brown; they were much more friable than those on the right and had a penetratingly foul odor. There was a surgical incision in the left buttock near the anal orifice which communicated with the gangrenous muscle of the left buttock.

Culture of the heart blood and of the gangrenous lesion of the buttock yielded an abundant growth of B. pyocyaneus and B. coli.

Microscopic examination of important sections showed: The anorectal tissue was scarcely recognizable; there was marked necrosis throughout, with slight

infiltration by round cells and a few polymorphonuclears. Gram-stained sections showed innumerable gram-negative bacilli adjoining each other almost everywhere, with very little intact fixed tissue present.

A section of the lung showed a roughly circular area approximately 4 mm. in diameter; the center was apparently composed of necrotic tissue and exudate, and contained abundant fibrin. There were extensive hemorrhage into the alveoli about the necrotic area, slight infiltration by round cells and a few polymorphonuclears. A similar section stained by Gram's method showed innumerable gram-negative bacilli, many of which were long and slender (B. pyocyaneus). The second section showed several fairly large circumscribed areas of scarring of lung tissue. In one area the scar tissue was quite cellular.

Sections of the alimentary canal showed moderate edema of all coats and areas of hemorrhages in the walls. Some of the hemorrhagic areas showed blue-stained, amorphous material and masses suggesting bacterial clumps. A section of the appendix revealed a wedge-shaped area of necrosis of the mucosa.

Sections of the marrow of a rib showed marked diminution in the number of myeloid cells, with very few megakaryocytes. The marrow of the tibia showed many fat cells and an absence of myeloid cells.

COMMENTS

The diagnosis of B. pyocyaneus infection can be established with certainty only by the isolation of this chromogenic organism. Fraenkel contended that the infection can be identified by histopathologic observations, such as the colonization of the organism in the walls of the blood vessels and the adjacent tissue and the lack of round cell infiltration about the necrotic areas. Clinically this condition can easily be confused with a number of other diseases. In the case reported it had to be differentiated from typhoid fever, bacterial endocarditis, essential thrombocytopenia, aleukemic leukemia and the purpuras. The fact, however, that ecthyma gangraenosum and possibly granulocytopenia are manifestations of B. pyocyaneus infection should lead one toward the diagnosis on a clinical basis.

That the skin is affected in B. pyocyaneus septicemias has been universally observed. Various forms of cutaneous lesions have been described in connection with this infection; the severe gangrenous lesions involving the anorectal region and the external genitalia are a characteristic feature of this condition. Fraenkel,[1] after describing minutely the cutaneous lesions and the pathologic basis for them, asserted that ecthyma gangraenosum, as described by Hitschmann and Kreibich,[3] is so peculiar, one might almost say so typical, that its recognition involves no difficulties. He said further that the manner of the localization of these lesions in the regions of the axillae, the external genitalia and the rectum, as well as on the inner side of the thigh, manifests the preference of B. pyocyaneus for these parts. Meader, Robinson and Leonard,[43] who injected B. pyocyaneus into rabbits and

43. Meader, P. D., Robinson, G. H., and Leonard, V.: Pyorubrin, a Red Water Soluble Pigment Characteristic of Bacillus Pyocyaneus, Am. J. Hyg. **5**:682, 1925.

guinea-pigs intravenously and intraperitoneally, observed that in certain instances renal abscesses, acute epididymitis and cutaneous lesions in the genital region developed; they therefore concluded that virulent strains of B. pyocyaneus exhibit a pronounced selective affinity for the genito-urinary organs of laboratory animals. Dwyer and Klinkerfuss [44] found that, while the pustular lesions are usually found on the head and trunk, the gangrenous ulcers are located on the buttocks and thighs. Kline and Maschke [45] in a recent report emphasized the presence of gangrenous lesions in the anogenital region.

Granulocytopenia, the diminution of the circulating granulocytes, as occurred in the case reported here, merits consideration as a clinical feature of pyocyaneus infection. Although this condition has been reported in connection with anginal infections due to streptococci, staphylococci and Vincent's organism, as well as with poisoning due to arsphenamine and benzene,[46] numerous reports have associated granulocytopenia with B. pyocyaneus infection. In fact, Lovett,[47] Dasse,[48] Delatour [49] and Linthicum,[50] who injected B. pyocaneus into animals intravenously, observed that the organism or its toxins seem to possess the power of effecting a granulocytopenia, either by destroying or by inhibiting the formation of the granular elements of the blood. Ghéroghiewsky [51] claimed to have found a leukocyte-destroying ferment in cultures of B. pyocyaneus. Clinical reports of cases of granulocytopenia in which the sole causative agent was B. pyocyaneus, as in our case, have been recorded by Lovett,[47] Linthicum,[50] Dasse,[48] Keeney,[52] Klinger,[53] Friedemann,[54] Mackeen [55] and Delatour.[49]

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44. Dwyer and Klinkerfuss: Dermatitis Gangraenosa Infantum, Arch. Dermat. & Syph. **11**:368 (March) 1925.

45. Kline, B. S., and Maschke, A. S.: Three Fatal Cases of Bacillus Pyocyaneus Infection, J. A. M. A. **98**:528 (Feb. 13) 1932.

46. Kracke, R. R.: Experimental Production of Agranulocytosis, Am. J. Clin. Path. **2**:11, 1932.

47. Lovett, B. R.: Agranulocytic Angina, J. A. M. A. **83**:1498 (Nov. 8) 1924.

48. Dasse, H. W.: Agranulocytic Angina, J. A. M. A. **91**:1718 (Dec.) 1928.

49. Delatour, B. J.: Agranulocytic Angina: A General Discussion of the Disease and Treatment, New York State J. Med. **32**:1, 1932.

50. Linthicum, F. H.: Pyocyanic Stomatitis with Agranulocytic Leukopenia, Ann. Otol., Rhin. & Laryng. **35**:1093, 1927.

51. Ghéroghiewsky: Du méchanisme de l'immunité vis-à-vis du Bacille pyocyanique, Ann. Inst. Pasteur **13**:298, 1899.

52. Keeney, M. J.: Pyocyanic Angina with Agranulocytosis, California & West. Med. **33**:502, 1930.

53. Klinger: Ein Beitrag zur Infektion mit Pyocyaneus-Bacillen, Charité-Ann. **34**:25, 1911.

54. Friedemann, U.: Ueber Angina Agranulocytotica, Med. Klin. **19**:1357, 1923.

55. Mackeen, R. A. H.: Bacillus Pyocyaneus in Blood Stream in a Case of Agranulocytic Angina, Canad. M. A. J. **24**:424, 1931.

The association of thrombocytopenia with granulocytopenia, so frequently encountered in the literature, makes the interpretation of the blood picture interesting. In our case, the occurrence of petechial hemorrhages and the progressive decrease in platelets to 15,000 at first led us to believe that we were dealing with an essential thrombocytopenia. One must conclude, however, that in this case the overwhelming infection by B. pyocyaneus depressed the bone marrow to such an extent that it interfered with the granulopoietic and thrombopoietic mechanism.

Pyocyaneus infection, according to Freeman,[56] occurs in two forms: the chronic, which has a course of weeks, months or years, and the acute, which is of several days' duration. The latter form is the most common in infants and children. B. pyocyaneus usually enters the circulation through lesions of the skin or mucous membranes, such as the ears, nose, tonsils, sinuses and lungs. In children the most common portal of entry is the gastro-intestinal tract, whereas in the new-born the umbilical wound has often been described as the focus of the infection. In our case, the past history of recurring cutaneous infections in the anogenital region seemed to indicate that the skin was the portal of entry.

There are no definite therapeutic agents on which one can rely in combating the acute forms of B. pyocyaneus infection. The treatment is merely expectant. Vaccines and autovaccines have been employed by Freeman,[56] Fraenkel [1] and Wollstein [25] with doubtful result. In the chronic form, however, autovaccines may prove valuable, as reported by Carter.[57] Repeated blood transfusions in our case had little effect on the course of the disease. Cutaneous lesions and infected wounds are successfully treated by local applications of 1 per cent solutions of acetic acid or dilute solutions (from 10 to 20 drops to a pint of water) of hydrochloric acid, as recommended by Taylor [58] and Unger.[59]

CONCLUSIONS

1. The incidence of B. pyocyaneus infection in children is reviewed.

2. The acute form of pyocyaneus infection is the most common form in infants and children.

3. B. pyocyaneus exhibits a predilection for the skin of the anogenital region, causing necrotic lesions termed "ecthyma gangraenosum."

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56. Freeman, L.: Chronic General Infection with the Bacillus Pyocyaneus, Ann. Surg. **64**:195, 1916.

57. Carter, H. R.: Bacillus Pyocyaneus Infection Cured by Vaccine, Lancet **1**:437, 1924.

58. Taylor, K.: Treatment of Bacillus Pyocyaneus Infection, J. A. M. A. **67**:1598 (Nov. 25) 1916.

59. Unger, E.: Zur Bekämpfung des Pyocyaneus-Eiters, Berl. klin. Wchnschr. **52**:271, 1915.

4. The usual portal of entry is the skin, mucous membranes, gastrointestinal tract or the umbilical wound.

5. Granulocytopenia and thrombocytopenia were present in the case reported, that of a rapidly fatal B. pyocyaneus septicemia in a boy, aged 7 years.

10515 Carnegie Avenue.

EFFECT OF POSTURE WORK ON THE HEALTH OF CHILDREN

J. ALBRIGHT JONES, M.D.
PHILADELPHIA

Great strides have been made in the field of preventive medicine, but there yet remains a great deal to be done. I feel fully justified in stating that very little has been done toward the prevention of deformity. By deformity I do not mean the extreme cases of deformity of the spine that one sees in the orthopedic clinics, but I refer to the poor examples of erect posture seen daily. I shall try to point out that there is a fairly definite relationship between posture and health, and also that by preventing bad posture one accomplishes a little toward the prevention of disease in its broadest sense. During recent years one has been constantly confronted with ardent workers who would blame nearly all ailments on some particular offender. Thus there are those who enthusiastically blame foci of infection, ultraviolet rays, vitamins and other factors; one must keep an open mind, and yet be willing to accept that which is proved to be of definite value. The relatively new field of posture work is gradually coming into its own, and I think that it will prove a useful method of increasing children's resistance to disease. "As the twig is bent, so is the tree inclined."

When the etiologic factors involved in bad posture are analyzed, it is found that the situation is one of much complexity, for it involves heredity, environment, habits and hygiene. When man became a biped and assumed the upright position, he immediately made an enemy of gravity, and he has been fighting this relentless foe ever since. When he walked on all fours, as a quadruped, the abdominal viscera were supported by the ventral wall of the abdomen, and the stress and strain on the spine and the attached muscles were much less than they are now. In the erect position, the abdominal organs are suspended one above the other, and they are often lacking in adequate support because of relaxed ligaments and muscles. Furthermore, the chest tends to become flattened, causing poorer aeration in the lungs, and the spine is apt to give in its more flexible region, especially in the lower part of the back. Primitive man, living an outdoor life, not hampered by

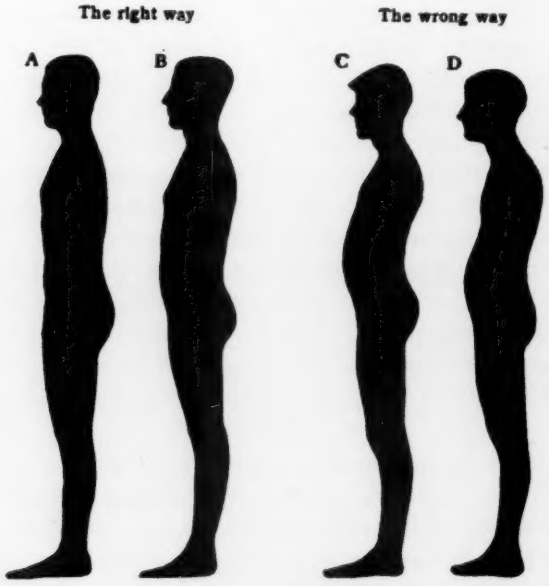
This paper was read before the Child Hygiene Society of Philadelphia, Nov. 6, 1932.

clothing and securing much more physical exercise, usually manifested good posture. The Indians have always been symbolic of grace and beauty of form. But man has now become what some one has aptly called a "standing-around and sitting-around animal"; he is subjected to a different environment, in which nearly all of his activities favor the forward position of the arms and head, thus encouraging curvature of the upper part of the spine and round shoulders. Sedentary occupations make for relaxation of ligaments and muscles. One writer said that it is not correct to say that spines are not perfectly adapted to the upright posture, but that it is more correct to say that human spines were not evolved to withstand the monotonous and trying posture entailed by modern environment and activity. Of course, there are other very important aspects. No doubt a great number of children have poor posture because they are chronically below par and it is always vitally important to determine just what is cause and what is effect. No child who is markedly malnourished and consequently weakened can have sufficient muscle tone to maintain correct body mechanics. Nevertheless, I think that, so far, the question of correct posture has been greatly neglected, and that after the causes have been eliminated, more attention should be paid to its particular effect. It is almost unnecessary to mention that most of the children in cities have inadequate room for outdoor exercise, owing to crowded quarters, and that the demands on the child's time in modern life have become excessive in many instances.

What is meant by good posture or, better still, good body mechanics? In the accompanying chart are seen four grades of posture; *A*, or course, represents the ideal. Probably 80 per cent of the members of our civilization would fall in groups *C* and *D*, and hardly more than 1 per cent in group *A*. In correct posture, as represented by *A*, the chin is straight ahead, the chest is up; the abdomen retracted so that it is pear-shaped, the small end being downward, and the back curves are within so-called normal limits. The body should be slightly tilted forward so that the weight is largely carried forward on the anterior half of the foot, where the "spring" is. It is easy to assume that a person with such a posture is giving every cell the ideal environment for its work, and that he is capable of a greater degree of efficiency than a person with posture *D*. The way the chest is carried in *A* makes for better aeration of the blood; the heart has more space within which to function, and with the abdomen thus retracted, better support is afforded for the whole abdominal viscera, which favors more satisfactory physiologic processes. If the correct position is not assumed ptosis of abdominal viscera must eventually result, with sagging of the stomach, kidneys and other organs, resulting in the posture shown in *D*. Of course,

there are many people who have a considerable degree of visceroptosis without conspicuous symptoms, but nevertheless it seems reasonable to assume that correct position of the viscera with proper aeration of the lungs must make for better and more permanent function.

When one looks for concrete evidence regarding the relation of posture to health, one has to admit that the clinical evidence that poor health is definitely related to poor posture, and vice versa, is not so convincing as the results of many of the laboratory tests, yet the evidence is gradually accumulating, and its significance is increasing. The



Body mechanics. *A*, excellent mechanical use of the body: (1) head straight above chest, hips and feet; (2) chest up and forward; (3) abdomen in or flat; (4) back, usual curves not exaggerated. *B*, good mechanical use of the body (compare with *A*): (1) head not too far forward; (2) chest not so well up or forward; (3) abdomen, very little change; (4) back, very little change. *C*, poor mechanical use of the body (compare with *A*): (1) head forward of chest; (2) chest flat; (3) abdomen relaxed and forward; back curves are exaggerated. *D*, very poor mechanical use of the body (compare with *A*): (1) head still further forward; (2) chest still flatter and further back; (3) abdomen completely relaxed, "slouchy;" (4) back, all curves exaggerated to the extreme. (This chart is prepared and issued by the Department of Hygiene and Physical Education, Harvard University, Cambridge, Mass., and the United States Department of Labor, Washington, D. C.)

committee on growth and development at the recent White House Conference on child health and protection had strong impressions about the matter, which were as follows:

1. Failure to gain weight and disturbances in digestion in spite of adequate diet and environment are often associated with poor posture.

2. If no organic lesions or foci of infection are present, weight increases and digestive disturbances improve with the improvement of posture.

3. Improvement of intestinal evacuation often occurs with improvement of posture.

4. Cyclic vomiting and certain presumably toxic crises often cease with proper correction of poor body mechanics.

5. A general feeling of alertness and well-being goes hand-in-hand with good posture.

It was also pointed out that in a survey of a public school at Chelsea, Mass., in which 2,200 school children between the ages of 5 and 18 years were studied, certain points stood out, and in a preliminary report not yet published the results were summarized thus:

1. Nine times as many children under special training as without training improved in body mechanics.

2. Poor body mechanics were not outgrown to any marked degree.

3. The stocky children had the largest percentage of good posture and the slender children the smallest.

4. Improvement in body mechanics was associated with improvement in health and in efficiency, the latter being judged by scholarship and deportment, and regularity of attendance was much greater.

5. In the groups given training in body mechanics, the rate of absence due to illness decreased during the year, so that the percentage of absences was considerably lower than among the children who did not receive training, whose rate of absences increased during the year.

6. Training in body mechanics had no significant effect on vital capacity.

7. Training in body mechanics improved the tone of the abdominal muscles and reduced the amount of fat deposited in the abdominal wall, as shown by a decrease in the circumference of the abdomen without a decrease in depth.

8. The average increase in the costal angle in inspiration was greater in the trained students than in the untrained ones.

9. Postural, functional or habitual lateral curvature of the spine almost constantly disappeared with the acquirement of better body mechanics, while it remained unchanged in the untrained group.

10. In the small group of children (seventy-six), studied for two years, the posture grade attained during the first year was in the majority of cases retained or bettered during the second year.

Such impressions as these gathered by the group of men working on the subject are very important and are worthy of consideration. Several other important facts tend to show that there is an important relation of posture to health. It is rather well recognized that the slender, underweight person more often succumbs to infection with the tubercle bacillus than the stocky person; I should like to suggest that this may in part be due to poor aeration of the lungs so common in the slender type of person with sunken chest. One of the commonest if not the

commonest problem with which the orthopedic surgeon has to deal is chronic backache. This condition is much more often due to faulty posture of long standing than to any other cause. If backache alone could be avoided, all work for prevention of conditions due to faulty posture would be more than paid for. Closely allied is the question of flat feet, and since this condition is taken care of at the same time that exercises for correct posture are given, a great saving of time and money would eventually be made if widespread corrective posture work could be carried out. It is not my aim to present a cure-all, but to try to point out that this field has been greatly neglected, and that it is rapidly being established that posture work is important in improving the men and women of tomorrow.

The task is not an easy one. If one could wave a magic wand and produce perfect posture, people would be eager for such correction, but when they realize that it takes a great deal of physical and mental effort, they do not cooperate so well. I feel that it will not be long before corrective exercises taught by those who have had at least some special training in this work will replace the present inadequate program of physical education in the schools, and also that the gymnasiums will be equipped with skilled instructors who can give proper posture exercises when necessary. It seems logical to assume that what one should strive for in physical health is not so much the development of huge biceps and calf muscles, but the attainment of the highest degree of efficiency, which depends on coordination and the correct use of muscles. It is not often that a muscle actually wears out, but frequently there is serious trouble because certain muscles have not been properly trained to perform the function they were intended for. In the World War a great many soldiers who had been passed as physically fit broke down under the physical strain because of poor posture.

It is not my purpose in this paper to go into detail regarding exercise, but I shall say a few words about the methods of handling cases of faulty posture. The following statements are taken from the preliminary report of the White House Conference Group. Of course, methods vary a great deal according to the age of the children, for whereas adults do only formal exercises, the instructor must rely largely on interesting and at the same time constructive games when working with young children. The methods to be used are as follows:

1. Methods applicable to infancy. (*a*) Congenital or birth deformities are, of course, to be handled by surgical methods and physical therapy.

(*b*) Acquired postural defects. From birth to 1 year of age, the spine is undergoing a rapid change of curvature from the single slightly convex dorsal curve to the normal compound curves. If the growing

skeletal bone is subject to abnormal stresses, abnormalities of growth develop, so that proper positions of holding the infant and symmetrical positions in recumbency should favor the normal symmetrical development of the skeletal muscular and visceral systems. The habit of carrying a baby on the arm tends toward crookedness; the common practice of letting the infant sleep on soft pillows and uneven surfaces is to be criticized. As the baby is reaching 6 months, he needs a hard surface and plenty of space. It is important to remember that an infant is seriously hampered in the use of his muscles when the diapers are pinned tightly to a band, shirt or stocking, so that he cannot stretch out straight without pulling his shoulders down or his hips up.

2. Methods Applicable to Childhood. (*a*) Between the ages of 2 and 6: Imitative play is surprisingly successful in changing poor body mechanics into good mechanics. (Certain games, such as playing circus, in which the children imitate the various animals, make them use some of the important muscles.)

(*b*) Between the ages of 6 and 12: Purposeful exercising sometimes aided by light apparatus and always by corrective positions to be assumed during rest periods in recumbency are the methods employed during this stage.

3. Adolescence. When the child enters adolescence, the same exercises and positions are applicable as in later childhood, but motives other than obedience may be counted on to stimulate interest and effort. Two of the most powerful of these motives are personal appearance and athletic prowess. During the later years of childhood and in adolescence, sufficient time should be spent with the subject to assure cooperation and to stimulate his desire to acquire good body mechanics, in order that the unfortunate family nagging may be eliminated. As I said before, it is not easy to accomplish the results desired, but I feel that the effort is worth while, and that one must not give up too quickly.

CONCLUSION

It should be a habit to think primarily in terms of prevention of disease, and I believe that one of the helpful measures in prevention is attainment of as high a degree of efficiency as possible; thus the cell is surrounded by the most favorable environmental conditions under which to function. One sees children daily who manifest poor posture; the seriousness of this aspect of work with children should be considered. I would again caution you regarding cause and effect. A child who is chronically malnourished is too weak to stand straight even if he knows how and has the desire to do so; but after his environment has been corrected and proper hygiene instituted, his posture should not be

forgotten. Those who know what constitutes good body mechanics should set an example for the child. There is sufficient clinical evidence that good health has a definite relation to good posture and that poor health has a definite relation to poor posture to make it desirable to strive for corrective posture work in schools and in hospital gymnasiums.

Pediatric Biographies

EZEKIEL DI CASTRO

SEVENTEENTH CENTURY

JOHN RUHRÄH. M.D.
BALTIMORE

Ezekiel di Castro is one of a number of persons with the same family name, and it is not certain that in the scanty records there has not been some confusion. Ezekiel was born in Portugal in the seventeenth century. He studied at Coimbra, and began the practice of medicine in Verona in 1639. He was called "insigne medico e subtil filosofo." He was learned in the Jewish literature and wrote "Il Colostro" about 1639, "Ignis Lambens rarum pulchrescentis naturae specimen," Verona, 1642, and "Amphitheatrum medicum in quo morbi omnes quibus imposita sunt nomina ab animalibus raro spectaculo debellantur," Verona, 1646. Ezekiel deserted his faith and joined the Roman Catholic Church, and it may be that he took the name of Peter, to whose credit there are several more books.

In "Il Colostro" is stated clearly some of the pediatric opinion current over three hundred years ago. The copy in hand is a little book of thirty-one pages, bound with "La Commare Raccoglitrice" of Scipion Mercurio, which is printed by the same printer and bears the same date.

The author commences with an explanation of the term which includes what is now called colostrum, also meconium, likewise the milk of a midwife who becomes pregnant, which was regarded as very deleterious, and lastly the cheesy curds formed in the baby's stomach. During pregnancy there is a cessation of menstruation, and the good part of this blood goes to nourish the fetus and the bad part goes into the breast. This causes, according to di Castro, all the ills the infant is heir to. He considers a long list of diseases, including epilepsy. When this menstrual blood concocted it came out as smallpox. Other things caused by it early or late were aphthae, vomiting, cough, vigils, fears, inflammation of the umbilicus, running of the ears, breaking out over the body and worms, not only the ascarides in the intestine but Crinones or hair worms, forming in the muscles of the back. Added to these are the ills caused by the colostrum, or milk, of a wetnurse who becomes pregnant. This unites with the other colostrum and causes various ills according to the temperament of the child, such as quartan fevers, a disease of the throat causing suffocation (diphtheria), scrofula, ranula, ringworm and melancholia; in short, almost all the ills come from colos-

trum. Hence the author recommends, naturally, that the baby should not be allowed to nurse the first few days, nor should it be allowed to suck a pregnant wetnurse.

One of the most interesting parts of the book deals with a device to cure squint which the author figures and which he claims to have

IL
COLOSTRO
DISCORSO
Agglunto alla Ricoglitrice di
SCIPION MERCVRIO
Dal Dottore
EZECHIELE DI CASTRO
Medico Fiſico Auinjoneſe.

IN VERONA,
Appreſſo Franceſco di Roſsi, M. DC. XXXXII.
Con licenza de' Superiori.

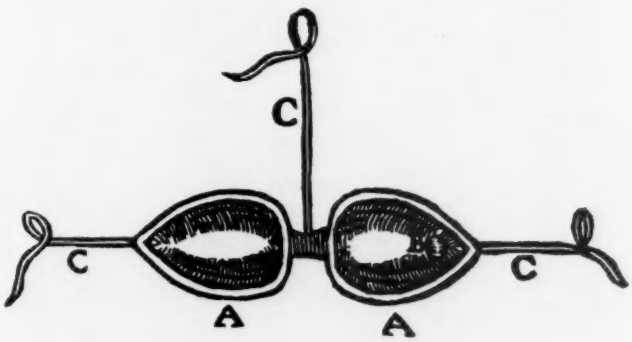
Title page of di Castro's book, "Il Colostro."

invented, but stenopeic spectacles go back to Paul of Ægina and they were shown in an illustration in George Bartisch's *Augendienst* which appeared in Dresden in 1583. A case of squint is reported which is of interest in that it might well be a case of poliomyelitis affecting the ocular muscles.

In this list of diseases which follow there undoubtedly should be added to the others cross eyes, a childhood disease which the author ascribes to the negligence of the nurse, who, while the child is in the cradle, permits it to receive the light cross wise and so makes a bad shift (to that side) and remains one eyed. It is not to be doubted that this happens oftenest, but Hippocrates recognizes another cause

30 IL COLOSTRO

In questo numero de mali che seguitano agl'altri si deue collocare indubitatamente lo sguardo storto malatia puerile, che l'Autore descriue dicendo che la causa sia la negligenza della balia, che mentre il bambino e in culla lo lascia riceuer la lume di trauerso, & cosi piglia quel catiuo ripiego e resta losco, nõ dubito che cosi sia spesisse me volte: ma Hippocrate riconosce vn'altra causa nel lib. 2. delle epidemie sect. 6. tes. 20. cioè dipendenza di qualche altro male della testa che si discarica & trasmette agl'occhi, e questa e vna strada molto frequente, tanto che è ancora vn segno fisonomico di quello che si troua nel ceruello, dice Hippocrate nell'istesso luogo, *quicunque ab ortu strabones, amentes, lapidei, maniaci, quibus autem non, alterius mali solutio*: cioè, che quelli che di natura sono guerci, è vn segno di esser matti ottusi furiosi; ma se non sarà di natura e vna risolu ione d'altri mali, quale può esser la causa? non certo altro che quel antico seminario che non hauendo per quella terza concotione assai ben separato l'escremento resto il cerebro distemperato & disposto à questi incommodi, si procuri dunque purgare il fanciullo e la balia debitamente, & poi per leuare quel brutto difetto degl'occhi, si facia questo istrumento.



Questi

Di Castro's device for the treatment of strabismus.

in book 2 of the epidemics, section 6, heading 20, that it depends on some other disease of the head which discharges itself and is transmitted to the eye, and this is a way of great frequence and it is also a physiognomonic sign of what one finds in the brain. Hippocrates says in the same place *quicunque ab ortu strabones, lapidei, maniaci, quibus autem non alterius mali solutio* that is in those who by nature are cross eyed, it is a sign of being idiotic, obtuse or maniacal; but if it is not caused by nature or from the resolution of another ill, what can be the cause?

Certainly none other than the old seeding by which the excrement not having separated well in the third concoction, the brain remains softened and disposed to those inconveniences. The child and the nurse should be weakly purged and then to take away this ugly defect of the eyes one makes use of this instrument [see illustration].

There are iron eye glasses like those used for horses, and only in the one which corresponds to the affected eye there is a little round hole in the part contrary to where the pupil of the eye is, and a glass lens is fitted in the cloth covering, and these glasses the baby is to wear day and night and they are only to be taken off two or three times a day to be cleansed. By the use of this instrument, invented by me, I was enabled to free a child of a noble. This was a child of about three years, it being necessary to let blood on account of high fever, the surgeon did it with a lancet, which affected the whole body so much that an eye of the child remained totally turned to the side so that one could see nothing of the black part, and there was such great pain that it made the child wild and unquiet. For three or four days it was quieted with anodynes, they applied [an omission?] a large redness and swelling which caused a rupture [i.e., break], but the eye remained the same for several days. There came to my mind to make this instrument, and with it in about fifteen days one could see the black of the eye a little and continuing it for two months it returned happily to normal, so that one could not see any defect, because nature, the friend of the light, searched it continually, and so the force of following that little ray which came through the little hole, it did what was needed for the part.

Pediatrics in Art

THE RESTRAINING CHAIR

JOHN RUHRÄH, M.D.
BALTIMORE

Throughout the middle ages and later restraining chairs were much in vogue, and almost every nursery today shows some form of this chair. The painting, in which a restraining chair is depicted, is by an unknown sixteenth century master and shows the children of the Duke of Savoy. The picture is in Turin. This chair is a handsome one befitting the position and wealth of the parents. It has a richly upholstered back and a hinged front secured by two catches. Children

Portrait of Filippo Emanuele, Emanuele Filiberto and Vittorio Amadeo di Savoia. (Photograph by Alinari.)

were placed in these chairs and left exposed to flies and insects, and in some of them the child had to stand up all the time. In writing about one kind of a restraining apparatus, in his "Children's Book," good old Felix Würtz made the following observation:

> There are stools for children to stand in, in which they can turn round any way, when Mothers or Nurses see them in it, then they care no more for the child, let it alone, go about their own business, supposing the child to be well provided, but they little think of the pain and miserie the poor child is in, in that standing. . . . I wish that all such standing stools were burn'd, and that never any were made, by reason of the great misery that Children endure from such standing, for I hold these stools a mere prison, or stocks for poor infants.

News and Comment

UNIVERSITY NEWS

The graduating class of the medical school of the Ohio State University presented to the university a portrait of Dr. Elmer G. Horton, professor and head of the department of pediatrics in that institution. Dr. Horton has been head of the department of pediatrics for many years, and for seventeen years has been on the staff of the Children's Hospital, of which he is now assistant chief.

GENERAL

Pediatricians Honored.—The Philadelphia Pediatric Society at a special meeting, May 18, presented medals of honor to Drs. Samuel McClintock Hamill, founder of the society, and Howard Childs Carpenter, professor of pediatrics in the University of Pennsylvania Graduate School of Medicine. Dr. Hamill made an address on "Recent Trends in Child Health" and Dr. Carpenter, on "The Preservation of Child Health." Honorary memberships in the society were conferred on both physicians and also on Drs. Philip Van Ingen, New York, and Kenneth D. Blackfan, Boston. Dr. B. Franklin Royer presented the medal to Dr. Hamill and Dr. Ralph M. Tyson, that to Dr. Carpenter. Dr. Hamill, for many years a member of the teaching staff of the University of Pennsylvania School of Medicine, is chief of the pediatric department in Howard, Presbyterian and Philadelphia Polyclinic hospitals. He served as chairman of the medical section of the White House Conference on Child Health and Protection in 1930 and is at present president of the American Child Health Association and chairman of the state emergency child health committee. He is a former president of the American Pediatric Society, American Academy of Pediatrics and American Association for the Study and Prevention of Infant Mortality. Dr. Carpenter was professor of pediatric hygiene in the graduate school and associate professor of pediatrics in the school of medicine of the University of Pennsylvania before he was appointed to his present professorship. He has been director of the department for the prevention of disease at the Children's Hospital of Philadelphia since 1913, medical director of the hospital since 1930, and pediatrician in charge of the children's department of the Graduate Hospital since 1926. Dr. Carpenter was secretary and treasurer of the American Pediatric Society from 1916 to 1931 and president, 1931-1932, and was president of the Children's Hospital Association of America, 1928-1930. He is now president of the Children's Bureau of Philadelphia.

Course in Pediatrics, University of Vienna.—The usual course in pediatrics will be given at the University of Vienna this year from September 25 to October 7.

CORRECTION

In the article by Dr. Stanley J. Seeger and Dr. Arthur A. Schaefer, entitled, "Blood Grouping," in the May issue (Am. J. Dis. Child. **45**:999, 1933), the following corrections should be made:

Page 1003, the heading of table 2 should read "Distribution of Patients."

Page 1006, in line 1, the names of Meixner and Wiener are misspelled; line 3 should read "agglutinogens (M and N) in normal human red cells."

Abstracts from Current Literature

Pathology, Bacteriology and Biochemistry

A Study of Vaccine Virus Pneumonia in Rabbits, R. S. Muckenfuss, H. A. McCordock and J. S. Harter, Am. J. Path. **8**:6 (Jan.) 1932.

The neurovirus of Levaditi obtained by the extraction of testicular tissue which had been inoculated four days previously, was injected into the trachea hypodermically or by catheter. This leads to a characteristic form of pneumonia in the rabbit, characterized by coagulated albuminous fluid and fibrin, with the appearance of large mononuclear cells at a later time. Necrosis may occur and cause hemorrhage and the infiltration of polymorphonuclear leukocytes. Guarnieri bodies were demonstrated in the epithelial cells of the bronchi in four of thirty-one animals.

Moore, Charlotte, N. C.

Vaccinal Infection of the Chorio-Allantoic Membrane of the Chick Embryo, E. W. Goodpasture, Alice M. Woodruff and C. J. Buddingh, Am. J. Path. **8**:271 (May) 1932.

A suspension of the Levaditi neurovaccine from fresh infected rabbit's testis was inoculated into the membrane of 12 day incubated chick embryos, through a window cut through the shell. A histologic description of the lesions produced is given. Guarnieri bodies were demonstrated in the mesodermal cells. It is probable that the Guarnieri bodies are composed in part of Paschen corpuscles, and that they exhibit similarities to the Borrell corpuscles of fowl-pox and the Lipschütz corpuscles of molluscum contagiosum. A discussion of the probabilities of culture of the virus of these three diseases outside the body is given.

Moore, Charlotte, N. C.

The Effect of Induced Hyperthyroidism on the Gastro-Intestinal Motility of Vagotomized Dogs. Dorothy Fetter, Louis Barron and A. J. Carlson, Am. J. Physiol. **101**:605 (Sept.) 1932.

Vagotomy did not prevent increased activity of the gastro-intestinal tract in dogs with induced hyperthyroidism. The authors therefore conclude that the influence of the thyroid on gastro-intestinal motility is largely, if not wholly, independent of the possible influence of the thyroid hormone on the gastro-intestinal vagus mechanism.

John D. Nourse, Cleveland

The Effect of Alum on Horses Used for the Production of Diphtheria Antitoxin. G. F. Leonard and J. R. Varley, J. Immunol. **23**:261 (Sept.) 1932.

The authors extended the observation of Glenny that the addition of potassium alum to diphtheria toxoid or toxin enhanced its antigenic property. They applied the method to the immunization of a large group of horses. It was found that the antigenic effectiveness of alum treated toxoid or toxin was about three times that of toxin or toxoid alone. Horses receiving alum treated antigen, however, showed a cumulative toxic effect. Typical symptoms of alum poisoning, i. e., anorexia, impaired nutrition, polyneuritis, anemia and paresis appeared. The mortality in this group of horses was so high that it overshadowed any increase in immunizing power due to the addition of alum. The authors feel, however, that the small amount of alum that might be added to two or three human doses of toxoid would cause no harmful effect.

Fothergill, Boston.

A Comparison of the Toxicity of Various Meningococcus Preparations. C. V. Riley and M. A. Wilson, J. Immunol. **23**:269 (Oct.) 1932.

Various preparations of meningococci were tested by the Shwartzman method. Preparations containing products of cell distintegration were more toxic than the simple filtrate of culture washings. The most toxic preparation was a defatted coccus antigen made by extracting the cells with alcohol and ether, and grinding in a mortar. In 1:10 dilutions, therapeutic antimeningococcus horse serum neutralized all the preparations in Shwartzman's sensitivity test. In mouse protection tests, Murray's unfiltered endotoxin was more toxic than the other preparations. High dilutions of serum did not protect against Murray's unfiltered endotoxin or the defatted coccus, although protection was afforded against the other preparations.

Fothergill, Boston.

Studies on Meningococcus: 1. Endotoxin. W. G. Malcolm and B. White, J. Immunol. **23**:291 (Oct.) 1932.

The demonstration of a potent meningococcus endotoxin is reported. A new method is presented for obtaining more stable and potent endotoxin than by the methods of Gordon and of Murray. The method consists in removing the cellular protein from meningococci by precipitation with acetic acid from sodium hydroxide extracts of the organism. The resulting endotoxin is a potent tissue poison, has a dilating effect on the blood vessels and produces hemorrhage in the brain. The Shwartzman phenomenon can be reproduced by it. It can be neutralized by some lots of specific immune horse and rabbit serum.

Fothergill, Boston.

Meningococcus Antitoxin: 1. Prophylactic and Therapeutic Tests on Guinea-Pigs. N. S. Ferry, J. Immunol. **23**:315 (Oct.) 1932.

In a previous communication Ferry and his associates showed that filtrates of bouillon cultures of the four meningococcus types possessed properties of a soluble exotoxin. The present paper reports experiments on guinea-pigs relative to prophylactic and therapeutic effectiveness of an antitoxin made by immunization with this so-called exotoxin.

The antitoxin protected guinea-pigs when injected a few hours previously, or simultaneously with, an intraperitoneal injection of a fatal dose of culture. The regulation antibacterial meningococcus serum was less effective, prophylactically and therapeutically, than the same dose of antitoxin.

Fothergill, Boston.

Meningococcus Antitoxin: 2. Therapeutic Tests on Monkeys. N. S. Ferry, J. Immunol. **23**:325 (Oct.) 1932.

The original findings of Flexner, that experimental meningitis can be produced by intraspinal injection of living meningococci in monkeys, are confirmed. A high percentage of monkeys having a severe experimental disease were saved by the intraperitoneal injection of antitoxin.

After animals thus treated had recovered for a considerable period of time, they were found refractory to subsequent fatal injections of meningococci, which indicated the development of an active immunity.

Fothergill, Boston.

Examination of Pooled Human Serum for Its Neutralizing Effect on the Poliomyelitis Virus. N. Paul Hudson and Edwin H. Lennette, J. Prev. Med. **6**:335 (July) 1932.

Hudson and Lennette have attempted to make an analysis of specimens of human serum for a property which for convenience is called "neutralizing" in reference to the virus of poliomyelitis. They used pooled specimens of serum from five to fifty persons. These groups were made up either of normal urban

adults or of persons of various ages known to have recovered from poliomyelitis (so-called "convalescents"). Monkeys (Macacus rhesus) were used in six experiments, and each experiment included a control monkey which was given an injection of cord suspension mixed with pooled normal monkey serum. All the controls died of poliomyelitis. All pooled human serum manifested the neutralizing property when the serum was undiluted and frequently when it was diluted 1:5 and 1:25. They conclude: "Further inquiry is necessary to determine whether there is any relation between the possible benefits in serum therapy and the experimental capacity of serum to neutralize the effect of the virus."

TURNER, Chicago.

THE METAMORPHOSES OF STREPTOCOCCI INTO SPORE-BEARING RODS AND FILTRABLE FORMS. A. C. EVANS, Pub. Health Rep. **47**:1723 (Aug. 19) 1932.

A streptococcus, a filtrable form and an aerobic spore-bearing rod are phases in the life cycle of an organism cultivated from patients with epidemic encephalitis and from the so-called herpetic and encephalitic viruses. The details of the transition from one form to the other are described in a few instances which exemplify metamorphoses that have been observed many times.

SANFORD, Chicago.

THE PATHOGENIC STREPTOCOCCI, THE RÔLE OF STREPTOCOCCI IN ERYSIPELAS, SKIN DISEASES AND MEASLES. DAVID THOMSON and ROBERT THOMSON, Ann. Pickett-Thomson Research Lab., July, 1931, vol. 7.

This volume is divided into three monographs. Monograph 12 concerns the rôle of the streptococci in erysipelas; monograph 13, the rôle of the streptococci in diseases of the skin, and monograph 14, the rôle of the streptococci in measles.

The monographs consist of a review of the world's literature on these subjects, a compilation that includes over one thousand six hundred reprints. It is a veritable atlas on these three diseases. The authors have been very painstaking and have produced a good companion volume to the "Rôle of Streptococci in Scarlet Fever" previously penned by them. They go into great detail and give historical, etiologic and experimental facts as well as discuss the epidemiology, complications, statistics, prognosis, serum treatment and immunity in each subject. The gleaned excerpts are clear and yet concise. Checking the articles at random does not disclose any discrepancies.

It is impossible to see how one who is interested in infectious or contagious diseases could be without this volume. Not the least important are the excellent plates which illustrate the various types of streptococci. The review is complete, meticulous in detail and should be available not only to those interested in contagious diseases, but to every one who is interested in infections caused by streptococci.

TOOMEY, Cleveland.

HAEMOLYTIC STREPTOCOCCI: THEIR GROUPING BY AGGLUTINATION. FREDERICK W. ANDREWES and ETHEL M. CHRISTIE, Medical Research Council, Special Report Series no. 169, 1932.

This is a detailed report of a seven years' attempt by agglutination reactions to construct a grouping of hemolytic streptococci which would be of value in clinical work and which would disclose whether serologic varieties could be correlated with apparently distinct diseases. Single strains of streptococci were found frequently to change greatly on cultivation. It appeared that only exceptionally are two strains of streptococci serologically identical, and very rarely are they entirely dissimilar. Almost always there is more or less group antigen in common between them. No one serologic form of streptococcus could be credited with the causation of scarlet fever, although three or four recognizable serologic types seemed exceptionally commonly found in it. No distinct types stood out from an assortment of puerperal, surgical and erysipelatous strains of streptococci. Andrewes and Christie state: "The more one studies haemolytic

streptococci the more strongly is the impression gained that they are in a state of constant flux in which it is difficult to find any firm foundation for a permanent systematic classification."

LEMASTER, Evanston, Ill.

MORPHOLOGIC CONTRIBUTION TO THE MECHANISM OF THE FORMATION OF BASOPHILIC GRANULES IN ERYTHROCYTES. P. MOLTENI, Scritti med. dedicati a Carlo Comba, ediz., Riv. di clin. pediat., 1929, p. 749.

The author traced the process of the formation of basophilic granulations of red cells from the erythroblasts. This study was made on cells found in the bone marrow, spleen and blood of a child with hypoplastic anemia and of animals poisoned with lead. A colored plate is presented picturing twenty cells showing the gradual development of the granulations.

HIGGINS, Boston.

AMOUNT OF COMPLEMENT AND OF CHOLESTEROL IN THE BLOOD IN RELATION TO THE IMMUNITY OF CHILDREN. M. RASPI, Scritti med. dedicati a Carlo Comba, ediz., Riv. di clin. pediat., 1929, p. 758.

The complement and the cholesterol of the blood are almost directly proportional. They are low in the blood of the new-born infant, especially when compared with the blood of the mother. They increase as the child grows older, with variations according to the health and immunity of the child. Ultraviolet radiation increases both complement and cholesterol. Acute infectious disease lowers them definitely. In chronic infections, such as tuberculosis, an increase of complement and of cholesterol indicates a state of improvement.

HIGGINS, Boston.

THE EFFECT OF THYROID THERAPY ON FAT METABOLISM. HUGO MAGISTRIS, Rev. Soc. argent. de biol. **7**:297 (July) 1932.

In eight rats, 100 mg. of thyroid extract were given for four days. The glycogen content of the animals was then found to be 2.49 per cent. Eight other rats were then given similar doses, with the addition of a preparation of the anterior lobe of the hypophysis. These rats were found to contain only 1.1 per cent of glycogen. As a similar effect can be obtained by an excessive administration of fats, the author assumes that the anterior lobe of the hypophysis may contain a hormone for fat metabolism.

SANFORD, Chicago.

CHANGES IN VISCOSITY OF NORMAL AND PATHOLOGIC BLOOD PLASMA DUE TO TEMPERATURE. JOHANNES JOCHIMS, Arch. f. d. ges. Physiol. **227**:759, 1931.

The relative viscosity of the blood plasma was found to decrease as the temperature increased from 10 to 50 degrees. The blood plasma of well children showed a different temperature coefficient than the plasma of sick children, depending on the colloidal state of the plasma colloids rather than on the total concentration of albumin. The temperature coefficient rose along with the specific increase in viscosity. The changes in plasma viscosity due to temperature depend on the swelling of the colloids caused by their water-binding ability.

LEMASTER, Evanston, Ill.

TEMPERATURE OF VENOUS BLOOD. H. ALDENHOVER and C. KORTH, Deutsches Arch. f. klin. Med. **173**:412 (July 25) 1932.

By thermo-electric determination of the temperatures of venous blood and of subcutaneous tissue of the forearm when the subjects drank 1 liter of water, the experimenters found that cold water (5 C.) reduced both temperatures whereas warm water (50 C.) reduced the temperature of venous blood while increasing the subcutaneous temperature.

DOOLEY, Kent, Conn.

CALCIFICATION IN VITRO: I. CALCIFICATION OF THE CARTILAGE OF RACHITIC RATS IN A SOLUTION OF INORGANIC SALTS. GEORG MEYER ZU HÖRSTE, Jahrb. f. Kinderh. **131**:203 (April) 1931.

Cartilage of the rachitic rat was incubated with the solution recommended by Shipley, Kramer and Howland (*Biochem. J.* **20**:389) and the change in composition of this solution was determined. During calcification in vitro, calcium and phosphorus leave the solution in equal molar quantities. Normal cartilage also removes smaller equal molar quantities, and normal bone placed in a solution poor in phosphate loses phosphate but not calcium.

CLAUSEN, Rochester, N. Y.

CONGENITAL CALCIFICATION OF THE ARTERIES AND OTHER TISSUES. W. IFF, Virchows Arch. f. path. Anat. **281**:377, 1931.

A child died a few minutes after its birth during the eighth month of pregnancy. Hydramnion had been present. Necropsy revealed widespread calcification of the inner portion of the media of the large and medium-sized arteries. A lesser degree of calcification was present in the intima and adventitia. Calcium had been deposited also in the interstitial tissue of the thyroid gland and kidney, in the renal glomeruli and glomerular capsules, in the retroperitoneal adipose tissue, in the pia-arachnoid of the brain, in the umbilical vein and in the placenta. In the arteries, the calcium had been deposited in the chromotropic ground substance. The femoral artery contained a larger amount of this substance than the corresponding vessel of a normal new-born infant, but no evidence of disorganization of the ground substance could be detected. Iff believes that dystrophic calcification, calcium metastasis, calcium gout and disturbance of calcium metabolism are to be excluded as causes of the calcification. He ascribes it to incomplete maturation of the connective tissue ground substance, which may have been congenital or the result of hydramnion.

SCHULTZ, Evanston, Ill. [ARCH. PATH.]

THE TOXIC CONDITION FOLLOWING INJECTION OF EXTRACT OF LYMPHATIC TISSUE (P-SUBSTANCE) AND ITS RELATION TO HIBERNATION. ALFRED NITSCHKE and ELIZABETH MAIER, Ztschr. f. d. ges. exper. Med. **82**:215, 1932.

Following the injection of large doses of P-substance, Nitschke's extract of lymphatic tissue, guinea-pigs and rats showed a characteristic picture of intoxication. In this condition the animals became sluggish and sleepy, ate little or nothing and showed a lowered temperature which was influenced by the surrounding temperature. The basal metabolism was considerably decreased, this drop preceding the lowered temperature. The blood sugar was low, while the alkali reserve was increased. The thyroid glands of these animals showed morphologic changes indicating decreased activity. The heart rate and respiratory rate were greatly slowed. The behavior and findings during this state of intoxication compare closely with those occurring during hibernation. Injection of P-substance into the dormouse produced a condition comparable to hibernation.

LEMASTER, Evanston, Ill.

EFFECT OF VIOSTEROL ON HIBERNATION. A. NITSCHKE, Ztschr. f. d. ges. exper. Med. **82**:227, 1932.

Four hedgehogs were kept in a dark cellar during the cold winter months. Two of the animals that were fed viosterol daily remained awake, were active, continued to eat regularly and maintained a body temperature of about 33 C. (91.4 F.). The third animal acted similarly as long as viosterol was given, but three weeks after its discontinuance the animal fell asleep and hibernated the remainder of

the winter, with a body temperature of only from 8 to 9 C. (46.4 to 48.2 F.). The fourth animal received no viosterol and slept during the entire period with a low body temperature.

Studies on the blood showed the same values for chlorine in all animals, but there were higher values for inorganic phosphorus and alkali reserve and lower values for calcium in the hibernating animals than in those fed viosterol. The irritability of the nerves and muscles was very marked in the hibernating animals, as well as the enlargement of the spleen and lymphatic tissue. The author suggests the hypothesis that hibernation depends on the function and activity of the lymphatic system which is influenced by the lack of vitamin D.

LEMASTER, Evanston, Ill.

INFLUENCE OF VIOSTEROL ON THE MORPHOLOGIC PICTURE OF ACTIVITY OF THE RAT'S THYROID. A. NITSCHKE, Ztschr. f. d. ges. exper. Med. **82**:236, 1932.

Bergfeld demonstrated that the thyroids of rats kept in the dark show numerous small colloid-free follicles with high epithelium actively proliferating, while the thyroids of rats exposed to sunshine show large follicles filled with colloid and composed of low epithelium. Nitschke demonstrated that the feeding of viosterol to rats produces the same morphologic picture of reduced activity in the thyroid that exposure to ultraviolet rays produces. Because of the fact that the basal metabolism of these two groups of rats was the same, the author suggests that there is a regulation mechanism between the thyroid, on the one hand, and the lymphatic system, on the other hand, and that viosterol plays an important rôle in this process.

LEMASTER, Evanston, Ill.

PARATHYROID HORMONE IN THE REGULATION OF CALCIUM: II. MANNER OF ACTION OF PARATHYROID HORMONE. CHRISTIAN BOMSKOV and GERHARD MOSCHINSKI, Ztschr. f. d. ges. exper. Med. **83**:326, 1932.

The course of the curve for calcium in the blood in rabbits receiving mixtures of varying proportions of calcium salts and parathyroid hormone was studied. In general, the height and length of the curve was found to correspond to a summation of the individual ingredients. However, when the mixture contained a proportion of 3 mg. of calcium to 1 unit of hormone, the height of the curve was only that which could be caused by the injected calcium alone. These results are explained by the assumption that the hormone raises the level of calcium in the blood, and that in this action the hormone is bound to the calcium in the ratio of 1 unit of hormone to 3 mg. of calcium.

LEMASTER, Evanston, Ill.

PARATHYROID HORMONE IN THE REGULATION OF CALCIUM: III. A NEW CALCIUM TEST. CHRISTIAN BOMSKOV and GERHARD MOSCHINSKI, Ztschr. f. d. ges. exper. Med. **83**:336, 1932.

The authors found that the injection of preparations of parathyroid hormone produced the maximum elevation of blood calcium in rabbits within fifteen minutes. They suggest this procedure for the determination of the potency of parathyroid hormone extracts. The results with rabbits are obtained in much less time although with less accuracy than the results with the method usually used with dogs.

LEMASTER, Evanston, Ill.

THE SIGNIFICANCE OF PARATHYROID HORMONE IN THE REGULATION OF CALCIUM: IV. THE MECHANISM OF ACCELERATION OF BLOOD CALCIUM REGULATION BY PARATHYROID HORMONE. CHRISTIAN BOMSKOV, Ztschr. f. d. ges. exper. Med. **83**:340, 1932.

The injection of epinephrine during the course of elevation of the blood calcium caused by parathyroid hormone produced a sudden drop in blood calcium. Further

experiments showed an increase of epinephrine in the blood following injections of parathyroid hormone. The author believes that when the blood calcium value is elevated by the injection of calcium salts, the administration of parathyroid hormone causes a drop in blood calcium, because it stimulates the outpouring of epinephrine. The effect of the various endocrine glands on regulation of the blood calcium is briefly discussed.

LeMaster, Evanston, Ill.

Nutrition

Studies in the Physiology of Vitamins: XVIII. Measurements of the Vitamin B Requirement in Several Species of Animals. George R. Cowgill, H. J. Deuel, Jr., Arthur H. Smith, Benjamin H. Klatz and H. H. Beard, Am. J. Physiol. **101**:115 (June 1) 1932.

The authors studied the minimum vitamin B requirement in mice, rats, pigeons and dogs, using as a criterion the minimum daily requirement of the vitamin to maintain the urge to eat. This requirement varied with the various species and with the size of the individual within the species.

The quantitative data obtained for each species were examined and tested, with the view to finding the best function of the body weight to use in estimating the organism's vitamin requirement. The data were found to agree well with the following expression:

$$\text{Vitamin per day} = \text{Ks} \times \text{weight}^{\frac{2}{3}}$$

if the value Ks is peculiar to the species. Further study showed that the value of this species' constant is inversely proportional to another variable, namely, the "maximum normal weight" of the species, and that by means of this relationship it is possible to calculate the vitamin requirements quite accurately, taking into account not only the size of the individual, but the species to which it belongs as well.

Nourse, Cleveland.

Advantages of Cultured Lactic Acid Milks. John Dorsey Craig and James A. Tobey, Arch. Pediat. **49**:534 (Aug.) 1932.

The writers review the literature on this subject; they conclude that cultured lactic acid milk offers many advantages over other types, and suggest powdered lactic acid milk as the most convenient and practical for general use. The processes of manufacture and composition of such products are discussed.

It seems that the writers' preference for cultured lactic acid milk, and powdered lactic acid milk in particular, is derived from a study of the literature rather than from personal experience, since no results of their own are presented.

Waddell, University, Va.

Effect of Feeding Irradiated Ergosterol to Cows on the Vitamin D Content of Milk. W. E. Krauss, J. Nutrition **5**:467 (Sept.) 1932.

Two Holstein cows in the same stage of lactation and maintained under as nearly identical conditions as possible were fed various amounts of viosterol dissolved in corn oil over periods of three weeks. Biologic tests revealed that the antirachitic potency of the butter fat increased as the number of rat units of vitamin D fed were increased. The authors found that the vitamin D in cod liver oil is more efficient for calcification in chicks than that contained in butter fat from cows fed viosterol. These findings are interesting in view of the report of other workers that the chick requires several times more rat units of vitamin D in the form of viosterol than in the form of cod liver oil. Also, substantiating the reports of Steenbock and his co-workers who found that vitamin D in cod liver oil and in irradiated yeast is poorly absorbed from the intestinal tract of cows, the writers found that vitamin D in the form of viosterol dissolved in corn oil is also poorly absorbed.

The vitamin D content of milk can be increased, but the most efficient method by which this may be accomplished is probably yet to be found.

Munns, Winnetka, Ill.

THE EFFECT OF DAIRY MANUFACTURING PROCESSES UPON THE NUTRITIVE VALUE OF MILK: 1. THE APPARENT DIGESTIBILITY OF FRESH WHOLE MILK AND OF EVAPORATED MILK. W. B. NEVENS and D. D. SHAW, J. Nutrition **5**:485 (Sept.) 1932.

Experiments were conducted, two commercial brands of evaporated milk, evaporated milk prepared in the laboratory and fresh whole milk being used. Young paired albino rats served as experimental animals.

Fresh whole milk proved superior to all three evaporated milks in the digestibility of its protein. This experiment had to do only with the completeness of digestion and not with the ease of digestion. The fact that the digestibility of the protein of fresh whole milk is greater than that of evaporated milk was corroborated by reversal trials.

The fats of all of the milks were found to be highly digestible, and the separate kinds showed no significant difference in digestibility.

The sugar of all the milks was completely digested, and there was no significant difference between fresh whole milk and evaporated milk in the digestibility of total solids.

Differences in digestibility do not fully explain the nutritive properties of the two kinds of milk, since evaporated milk proved superior for growth.

MUNNS, Winnetka, Ill.

SCIENCE AND ART IN CHILD NOURISHMENT. C. ANDERSON ALDRICH, J. Pediat. **1**:413 (Oct.) 1932.

The problem of cultivating the child's appetite is discussed. Arbitrarily dictating the amount of foods to be taken by a child and forcing the child to eat according to orders is condemned. The author advises more tolerance in the feeding of infants and more attention and respect for the child's appetite. In one hundred new-born infants studied, the gain in weight during nine days showed no correlation with the total amount of food ingested. The technic used by the author in feeding during the first year of life is presented. Development of the proper attitude toward food is prerequisite for the proper application of the present scientific knowledge of nutrition.

LEMASTER, Evanston, Ill.

INFANT FEEDING. E. S. WEGNER, Nebraska M. J. **9**:377 (Sept.) 1932.

It is stated that, while infant feeding has been simplified, it still has its problems. So-called education of the public by bureaus, municipal health departments, bulletins, pamphlets, insurance companies, manufacturers, magazines and other sources has been productive of unintelligent management of nutrition in children. Advertisements of food products have scattered abroad much information, some good and some not good. "Directions on the label" has been too frequently the only advice the mother has received. There are certain fundamentals of infant feeding which should be known by any person in charge of infant feeding; knowing these, she is able to adapt normal babies to many different sorts of preparations. The importance of breast feeding is stressed.

HAMILTON, Omaha.

SOME DRIED FOODS USED IN INFANT FEEDING. CHARLES W. MARTIN, New York State J. Med. **32**:1012 (Sept. 1) 1932.

The manufacture, composition and use of the various dried milks and milk substitutes used in this country are described. While they are not "the long-awaited infant feeding panacea," each has some value, especially in selected cases.

The dry milks give a safe milk supply and are especially valuable when traveling or when only frozen milk can be obtained.

Some of the reconstructed or synthetic milk preparations are not taken as well as milk formulas and are more apt to be vomited.

AIKMAN, Rochester, N. Y.

CRITIQUE OF THE ROENTGEN SIGNS OF INFANTILE SCURVY. KATSUJI KATO, Radiology **18**:1096 (June) 1932.

The clinical and roentgen findings in thirteen cases of infantile scurvy are presented. The interpretation and evaluation of the usual roentgen signs in the bones are discussed. The majority of these changes are not pathognomonic for infantile scurvy. The one sign that is absolutely unique is that of subperiosteal hemorrhage. The white line of Fraenkel, *Trümmerfeldzone,* Wimberger's sign, separation of epiphyses and beading of the ribs may each be found in other conditions and are not absolutely characteristic for scurvy. Pelkan's triad is a valuable adjunct in the diagnosis of latent scurvy. LEMASTER, Evanston, Ill.

BREAST MILK PRODUCTION DURING NEWLY-BORN PERIOD. ARTHUR G. QUINN, South. M. J. **25**:1061 (Oct.) 1932.

The author believes that routine pumping of the breast at one feeding period during the day in a maternity hospital is practical. It provides a ready supply of breast milk for the hospital. With the cooperation of the attending physician it can be carried out in a private institution.

In the newly-born period, one complete emptying of the breasts in twenty-four hours does not increase the production of breast milk in five days.

Multiparous mothers do not produce more milk than primiparous or duiparous mothers. White and colored mothers produce approximately the same amount of milk in twenty-four hours. The increase and decrease of production at the various feeding periods occur at the same time in white and colored mothers. An average of all figures shown for production gives a decrease and an increase of production every twelve hours. SCHLUTZ, Chicago.

VITAMIN A RESERVES OF THE HUMAN LIVER IN HEALTH AND DISEASE. T. MOORE, Lancet **2**:669 (Sept. 24) 1932.

The amount of vitamin A was determined in more than three hundred specimens of liver from human beings, obtained at autopsies, by means of the antimony trichloride method. The vitamin A reserve varied over an extremely wide range, even among healthy subjects dying from accidental causes.

"Since adequate vitamin A reserves were frequently observed in a wide variety of infective conditions it is plain that vitamin A should not be regarded as a positive auto-infective agent, indiscriminate in action." LANGMANN, New York.

BERIBERI. P. R. KEIZER, Nourrisson **20**:291 (Sept.) 1932.

The importance of recognizing the latent type of beriberi in infants is stressed. The symptoms are general; the baby cries easily, refuses the breast and has a poor appetite, and the voice may be hoarse and accompanied by a cough. There may be constipation and diminished urinary output. Early recognition of the correct diagnosis is important, as a latent case may quickly and with slight provocation progress into one of the acute forms, the meningitic, cardiac or toxic types, with early death. In the latent form, examination reveals slight cyanosis, puffiness of the face, dilation of the heart, distention of the abdomen, sluggish or absent tendon reflexes and papilledema. Lumbar puncture shows a spinal fluid under increased pressure, but otherwise normal. Early diagnosis and treatment are important. The prognosis must be guarded. MCCLELLAND, Cleveland.

ELIMINATION OF PHOSPHORUS BY THE KIDNEY IN ANIMALS TREATED WITH LARGE DOSES OF IRRADIATED ERGOSTEROL. L. FASSIO, Riv. di clin. pediat. **30**:609 (May) 1932.

Following the administration of a large dose of irradiated ergosterol (10 cc. of vigantol) to rabbits, the daily excretion of inorganic phosphorus by the kidneys

showed a marked increase (from three to five times the normal amount); the maximum excretion was reached on the third day, and a normal amount was not reached again for from two to three weeks. Both fasting animals and those fed a measured diet showed this increase. The giving of bisodium phosphate or of glycerophosphate did not cause an increase of phosphate excretion by the kidney.

HIGGINS, Boston.

PROTEIN METABOLISM IN THE ARTIFICIALLY FED CHILD: II. RELATIONS BETWEEN PROTEINS AND CARBOHYDRATES IN THE DIET AND THEIR INFLUENCE ON THE FECAL REACTION AND FLORA. P. VINCENZO, Riv. di clin. pediat. **30**:790 (June) 1932.

The nitrogen balance was determined in several series of observations on infants, during which the sugar of the formula was increased or various carbohydrates, starches or sugars, were given.

Increasing the intake of carbohydrate always increased the nitrogen retention. The more carbohydrate given, the less nitrogen was found in the stools. The nitrogen of the stools was greater when starch was used in the diet than when sugar was used. The relative amounts of protein and carbohydrate in the diet determine whether the stools are acid or alkaline. The acid stool is marked by the presence of B. bifidus.

HIGGINS, Boston.

NEW CHART FOR INFANT FEEDING. G. DE TONI, Riv. di clin. pediat. **30**:993 (Aug.) 1932.

The author has outlined a chart on sectioned paper for plotting the body weight, volume of food, calories and energy quotient (calories per kilogram of body weight). At the left side of the chart data are given as to the caloric value per thousand grams of common foods of infants. Instructions as to usual optimum food requirements are given at the foot of the chart.

HIGGINS, Boston.

FURTHER EXPERIENCES IN THE PROPHYLAXIS OF RICKETS WITH CITRIC ACID MILK. HEINRICH WEISSENBERG, Arch. f. Kinderh. **97**:93 (July 22) 1932.

Of 442 infants fed whole citric acid milk, only 6 per cent developed signs of rickets, and these signs were very mild. Of 450 breast-fed infants, 12.9 per cent showed rachitic changes. The author believes that acid milk should be used more in feeding artificially fed infants.

LEMASTER, Evanston, Ill.

VITAMIN E DEFICIENCY. A. JOHÁSZ-SCHÄFFER, Virchows Arch. f. path. Anat. **281**:3, 35, 46, and 53, 1931.

In four consecutive articles, the author presents the results of an experimental study of the effects on rats of a deficiency of vitamin E. Both male and female rats maintained on a synthetic diet devoid of this vitamin were incapable of reproduction. In the males, the loss of fecundity was associated with severe changes in the testes. The germinal epithelium of the seminal tubules underwent degeneration and necrosis; spermatogenesis ceased, and in the terminal stages the tubules contained only a single layer of cells. The Sertoli cells and the interstitial tissue revealed no changes. In females, in spite of the loss of fecundity, no morphologic alterations in any of the structural elements of the ovary could be detected. The addition of vitamin E (wheat germ oil) to tissue cultures caused active proliferation of the cells, and the zone of active growth was greater than in control cultures. Inactivated oil did not have a similar stimulating effect. Both the active and the inactivated oil were taken up in equal degree by the culture cells, leading to the conclusion that the growth-promoting action is due to the vitamin and not to the nutritive properties of the substance used. Rats could not be accustomed to the deficiency by gradual withdrawal of the vitamin-containing substance. When an excess of vitamin E was fed and the material was then

suddenly withdrawn, evidences of deficiency manifested themselves. When an excess of vitamin E was fed, it was excreted in the feces in quantities sufficient to render the feces protective against avitaminosis in rats for which such feces were the only available source of vitamin. The feces of rats on the deficient diet had no such protective action, leading to the conclusion that vitamin E is not formed in the intestinal canal as the result of bacterial action.

SCHULTZ, Evanston, Ill. [ARCH. PATH.]

EFFECT OF DEFICIENCY OF VITAMIN E ON THE FEMALE RAT. A. JUHÁSZ-SCHÄFFER, Virchows Arch. f. path. Anat. **282**:662, 1931.

A previous series of communications, which have been abstracted in the *Archives of Pathology*, showed that a deficiency of vitamin E in the diet of male rats resulted in sterility through the complete inhibition of spermatogenesis. In female rats on a similar diet, no histologic abnormalities of the ovary could be detected, follicular development and ovulation proceeding in normal manner. Such females became impregnated, but failed to give birth to young. In the present experiments, females maintained on a diet deficient in vitamin E were mated with males kept on an adequate diet. The fecundity of the males was established by their ability to impregnate normal females. Females that became impregnated shortly after being placed on the deficient diet gave birth to young, most of which were dead; the few living young died within a few days after birth. The next pregnancy of such females resulted in a smaller litter of young all of which were born dead. In succeeding pregnancies, the number of young, all born dead, decreased, until finally no young were born, all having died in utero and undergone resorption. If the female was now placed on a diet containing vitamin E, successive pregnancies resulted in the birth of young, the number of living young being inversely proportional to the number of pregnancies without delivery through which the female had passed. Deficiency of vitamin E does not cause sterility in the female, but only an inability to bring forth living young. The deficiency acts apparently, not on the female, but on the young. Work previously abstracted showed that the addition of wheat germ oil containing vitamin E to cultures of rat tissues brought about an increased rate of growth of the tissue. In explanation of the so-called sterility of the female, the author postulates that the deficiency of vitamin E inhibits the rapid cellular divisions of the early stages of the embryos, just as it inhibits the rapid cellular divisions necessary for spermatogenesis.

SCHULTZ, Evanston, Ill. [ARCH. PATH.]

RESEARCHES ON THE DIGESTIVE PHYSIOLOGY OF NURSLINGS: XV. THE STATE OF THE FERMENTS OF THE DIGESTIVE ORGANS IN DYSTROPHY AND DYSPEPSIA. O. NAUMANN, Ztschr. f. Kinderh. **53**:1, 1932.

The digestive ferments of the organs of rats kept on various diets were determined quantitatively. In rachitic animals only minor disturbances of lipase and erepsin were noted. On diets high in fat and poor in vitamins the organs showed diminished diastase and erepsin and nearly a complete disappearance of trypsin and lipase. Trypsin and lipase disappeared from the organs of animals in which acute diarrhea and coma were produced; pepsin and erepsin disappeared only occasionally. Chronic diarrhea resulted in a diminution of trypsin and lipase and, at times, an increase in pepsin. Prolonged hunger, which leads to atrophy of the organs, also results in the disappearance of trypsin and lipase. In acute intestinal intoxications and in infections the ferments are relatively resistant, as compared to states in which there is atrophy of the organs. Only in chronic digestive disturbances are the ferments also affected (rachitogenic and vitamin-poor diets). The order of instability of the ferments is as follows: lipase, trypsin, pepsin, erepsin, and diastase. The disappearance of lipase does not follow that of trypsin or vice versa.

SHELLING, Baltimore.

THE TREATMENT OF RICKETS IN ARTIFICIAL "SUNLIGHT" ROOMS. ERICH NASSAU, Ztschr. f. Kinderh. **53**:162, 1932.

Rickets in children was definitely healed in from fourteen to ninety days when the patients were exposed daily in an "artificial sunlight" room, lighted and warmed by a combination of ultraviolet rays and infra-red rays.

SHELLING, Baltimore.

Prenatal Conditions

PERSISTENT TRUNCUS ARTERIOSUS AND CONGENITAL ABSENCE OF ONE KIDNEY WITH OTHER DEVELOPMENTAL DEFECTS. DONALD C. BEAVER, Arch. Path. **15**:51 (Jan.) 1933.

The case reported here showed the following congenital anomalies: (1) persistent truncus arteriosus (common arterial trunk with complete defect of the aortic septum and partial defect of the interventricular septum); (2) aplasia (agenesia) of the left kidney and ureter; (3) accessory pancreas in the duodenum and ileum, and (4) accessory spleen in the pancreas.

LEMASTER, Evanston, Ill.

CONGENITAL SKELETAL DEFORMITIES OF THE SPINE AND RIBS. WILLIAM WILLIS ANDERSON and DON F. CATHCART, Arch. Pediat. **49**:827 (Dec.) 1932.

A case of congenital skeletal deformities of the spine and ribs is presented.

WADDELL, University, Va.

CONGENITAL DIAPHRAGMATIC HERNIA WITH DEXTROCARDIA. CHESTER H. DAVIDSON, M. J. & Rec. **136**:492 (Dec. 21) 1932.

A case of congenital diaphragmatic hernia was reported in a youth of 18 years. An exploratory laparotomy revealed about 20 cm. of descending colon and an enlarged liver in the abdominal cavity. The left plural cavity contained the other abdominal contents matted together. The heart was displaced to the right. The opening in the diaphragm was large enough to permit the closed fist. Operation was undertaken because for a week the patient had vomited after eating, and he had lost 14 pounds (8.6 Kg.) in the last five months. He had had pain in the epigastrium for one year. He made a good recovery from the operation, but the symptoms recurred. The patient died twenty days after operation from pneumonia.

WILLIAMSON, New Orleans.

PARTIAL ACHONDROPLASIA. BRUCE M. PHELPS, United Fruit Co. Med. Dept., 20th Annual Report, 1931, p. 188.

The author reports the case of a girl, aged 16 years, which showed the flat thoracic back, trident-shaped, relaxed hands, deformed feet with genu valgum and relaxed hip joints, but lacked other characteristics of achondroplasia. Phelps classifies this condition as a partial achondroplasia.

LEMASTER, Evanston, Ill.

A CASE OF OXYCEPHALY. GERTRUDE HERZFELD, Tr. Edinburgh Med.-Chir. Soc., 1932, p. 168; in Edinburgh M. J., October, 1932.

A girl, aged 8 years, was presented to the society with the characteristic prominent eyes, squint, bulging temporal regions, wide lower jaw and narrow maxillae which soon result in irregular teeth. There was no disturbance of mentality as yet, nor was there any associated congenital malformation of the extremities.

NEFF, Kansas City, Mo.

DIFFERENTIAL DIAGNOSIS OF DEXTROCARDIA IN INFANCY. ALICE LEFKOWITZ, Deutsche med. Wchnschr. **59**:57 (Jan. 13) 1933.

The author describes congenital diaphragmatic hernia on the left side in an infant, 3½ months old, which was verified by operation and autopsy. At first the case gave the impression of simple dextrocardia.

Attention is called to the fact that dextrocardia should be clearly differentiated from complete situs inversus, diaphragmatic hernia, adhesive pleuritis on the right side, exudative pleuritis on the left side, empyema and pneumothorax.

Congenital diaphragmatic hernia is not so rare as it was thought to be. Greenwald and Steiner collected eighty-two cases from the literature.

KERESZTURI, New York.

DISSOCIATION OF THE RESPIRATORY CENTER IN ANIMAL EXPERIMENTS. ALBRECHT PEIPER and OTTO CAMMANN, Jahrb. f. Kinderh. **136**:165 (July) 1932.

Peiper attributes disturbances in the respiration of premature infants to a dissociation (*Zerfall*) of the respiratory center; the more recently developed portion of which being incapable of regulating the respiration, lower centers gain control. If experimental animals are made to breathe pure carbon dioxide or nitrogen, they assume a kind of respiration typical of the asphyxial attacks of premature infants.

CLAUSEN, Rochester, N. Y.

CONGENITAL CYSTIC LYMPHANGIOMA OF THE NECK. LUDVIK HAVLASEK, Časop. lék. česk. **70**:1454 (Oct. 30) 1931.

Cystic lymphangioma of the neck is important from the standpoint of dystocia and of theoretical genesis. The causative factors suggested by various authors are cited as injury and compensatory lymphatic outpour; primary lymphangioma with secondary ectasia and hypertrophy; anomalies of the vessels; purely mechanical, amniotic traction, an abnormal number or position of lymph vessels; abnormal continuity of the lymphatics; superactive lymphangioblastomas; actual tumor, and separation of embryonal tissue with secondary blastoma hypertrophy. A complete macroscopic and microscopic description of a stillborn infant is given, but no conclusion as to a definite etiology was arrived at.

STULIK, Chicago.

Diseases of the New-Born

MICROSCOPIC CEREBRAL HEMORRHAGE IN STILLBIRTHS AND NEW-BORN DEATHS: STUDY OF FIFTY-THREE INFANTS WITH RELATION TO MINUTE HEMORRHAGES OF MEDULLA OBLONGATA. F. A. HEMSATH and MYRTELLE M. CANAVAN, Am. J. Obst. & Gynec. **23**:471 (April) 1932.

Microscopic examination of one or two sections of the medulla oblongata in stillborn and dead new-born infants showed microscopic hemorrhages in thirty-four instances (64 per cent) among an unselected series of fifty-three necropsies. In twelve cases this observation supplied an anatomic cause of death which otherwise would have been lacking.

ZIEGLER, Minneapolis.

INTRACRANIAL BIRTH INJURIES. EDWARD C. HUGHES, Am. J. Obst. & Gynec. **24**:27 (July) 1932.

Recent statistics concerning the incidence of birth trauma show a marked increase in intracranial lesions. In order to lessen the incidence of intracranial birth injuries labor should not be considered from the maternal standpoint alone, but some thought should be given to the mechanics of the fetal cranium and its supports. The following points should be stressed:

The fetal brain is protected against the forces of labor by several mechanisms, of which the dural septums and the cerebrospinal fluid are perhaps the most important.

The balance of intracranial pressure is controlled by these membranes and the cerebrospinal fluid. Laceration of these membranes allows a disturbance in the intracranial pressure balance, which in turn causes distention and rupture of the blood vessels and sinuses. The dural septums are torn in cases of abnormal position with disproportion, in faulty application of forceps, in rapid and premature labor and in hurried breech presentations.

More carefully watched first and second stages of labor will reduce the incidence of intracranial injury.

Greater conservatism in the induction of premature labor and in the use of mechanical procedures will reduce the number of fetal accidents and deaths.

ZIEGLER, Minneapolis.

AN UNUSUAL MANIFESTATION OF EPIPHYSEAL AND JOINT PATHOLOGY IN A NEW-BORN INFANT. MILTON J. GEYMAN, Am. J. Roentgenol. **26**:868 (Dec.) 1931.

Conditions present at birth are essentially chondrodystrophies, congenital syphilis and anomalies of development and diseases of the osseous system. In the case presented, the findings were found in many joints as follows: (1) multiple, small, granular, osseous nuclei scattered about the joint space in most of the large joints, including the spine; these are distinctly separate from the epiphyseal centers for the long bones, some of which show an uneven, ragged contour; (2) curiously jagged contours of carpal and tarsal centers, most marked in the os calces, and (3) short left extremity (the measurements of which were: umbilicus to internal malleolus, 8½ inches, and anterior superior spine to internal malleolus, 7 inches). Measurements of the right leg were: umbilicus to internal malleolus, 10 inches, and anterior superior spine to internal malleolus, 8½ inches. These changes would seem to make chondrodystrophy the most likely etiology. The localized malacia in the centers of the hand and foot could easily conform to the pathologic description of the disease. The lack of periosteal changes and particularly the cleancut appearance of the diaphyses would appear to rule against even atypical syphilis. Periodic roentgen examination of the child will be necessary to corroborate the present conjecture.

STULIK, Chicago.

PATHOGENESIS AND CLINICAL SYNDROMES OF BIRTH INJURIES. G. ALEXANDER YOUNG, Nebraska M. J. **17**:505 (Dec.) 1932.

Of every one hundred stillbirths or neonatal deaths, between seventy and eighty are due to intracranial lesions. The infant runs a risk of sequelae of birth injury — spastic paralysis, athetosis, epilepsy and the various grades of mental retardation and enfeeblement. The bleeding may be either gross or punctate. Premature infants are more susceptible to hemorrhage. The location of the hemorrhage determines the syndromes that occur. Follow-up study shows that in a fair proportion normal health results. The author concludes his article with case reports and encephalograms demonstrating atrophic conditions in the cortex.

HAMILTON, Omaha.

THE PREVENTION OF INTRA-CRANIAL INJURY. WILLIS H. TAYLOR, Nebraska M. J. **17**:510 (Dec.) 1932.

The infant mortality in the United States from intracranial injury is about 2.7 per cent. This percentage does not take cognizance of the morbidity. Personal experience leads the author to conclude that intracranial injury has decreased in the last fifteen years. The greater the prematurity of the fetus, the more common are birth injuries. Rapid delivery, such as by precipitate labor, forceps and rapid breech extraction, does not allow time for adjustment of the fetal head. The author recommends that if there is a history of hemophilia, the mother be given cod liver oil during pregnancy, and that if there is a history of premature delivery, she be given thyroid. The problem of syphilis should be ade-

quately met. It is stated that in breech extraction there is a large percentage of cerebral hemorrhage. Undue haste is unnecessary in delivering the after-coming head. Few babies are lost from asphyxia, but many are lost from cerebral injury. Immediately after any prolonged labor or after any difficult assisted delivery, it is advisable to give intramuscularly from 20 to 30 cc. of the father's blood to the new-born infant. The use of a 5 per cent carbon dioxide and 95 per cent oxygen mixture is regarded as the best measure for resuscitation.

HAMILTON, Omaha.

EARLY DIAGNOSIS AND TREATMENT OF INTRA-CRANIAL HEMORRHAGE IN THE NEW-BORN. CLYDE MOORE, Nebraska M. J. **17**:513 (Dec.) 1932.

The most common symptoms found early are as follows: 1. Signs of cortical irritability, crying and heightened irritability of the motor centers, such as twitching of the muscles, spasticity and convulsions. The infant may be very quiet or even comatose, but usually even in these cases there are early signs of cortical irritability. 2. Refusal to nurse. 3. Disturbance of respiration. The breathing may be either slow or rapid and irregular. 4. Cyanosis or pallor. 5. Signs of increased intracranial pressure. 6. Paralysis. 7. Ocular signs. 8. Changes in coagulation and bleeding time of the blood. In differential diagnosis there must be considered sepsis of the new-born, atelectasis, congenital heart disease and pneumonia.

The immediate indications in the treatment of these babies are as follows: (1) stopping of the hemorrhage by injecting from 10 to 20 cc. of blood intramuscularly, repeating the injection in twelve hours if there are signs of continuing hemorrhage, or a decompression operation; (2) relief of the intracranial pressure by either spinal or cisternal puncture; (3) maintenance of action of the vital centers, respiratory and cardiac, by the use of 10 per cent carbon dioxide in oxygen; (4) control of convulsions by phenobarbital sodium, from ⅛ to ¼ grain (8.1 to 16.2 mg.); (5) maintenance of fluid balance and nutrition.

HAMILTON, Omaha.

TWO CASES OF GONORRHEAL OPHTHALMIA NEONATORUM TREATED BY VACCINE WITH RECOVERY. LEMELAND, Bull. Soc. d'obst. et de gynéc. **21**:254 (April) 1932.

The author describes two cases of gonorrheal ophthalmia neonatorum in which the patients were treated locally by the instillation of silver nitrate and lavage of the eyes. Vaccine made of gonococci, supplied by the Pasteur Institute, was also given, and to this the author attributed the recoveries. In the abstractor's opinion this is rather doubtful.

GLASER, Rochester, N. Y.

ALBINISM IN A NEW-BORN INFANT. GONNET, Bull. Soc. d'obst. et de gynéc. **21**:269 (April) 1932.

The author presented an albino infant without ocular lesions. The maternal grandparents were albinos. The parents of the child were Algerians. The Wassermann reaction was positive in the mother's blood serum and in the blood of the cord. The mother had delivered another albino infant three years previously, which had developed normally.

GLASER, Rochester, N. Y.

THE DIAGNOSIS AND TREATMENT OF THYMIC HYPERTROPHY IN THE NEW-BORN. R. SARASIN, Rev. franç. de pédiat. **8**:483, 1932.

The author reported twenty cases in the new-born which he considered by clinical and roentgenographic findings to be thymic enlargement. All except two of the patients had an amelioration of symptoms and a lessening of the upper mediastinal shadow after two or three exposures to the roentgen rays. The

two patients mentioned died following attacks of repeated dyspnea, followed by convulsions. In only one of these cases was an autopsy permitted. In this case, the thymus weighed 25 Gm., which is about the size of the thymus of a normal child of 1 year.

SANFORD, Chicago.

ONE CASE OF CONGENITAL CYST OF THE KIDNEY FOUND IN THE NEW-BORN. G. STEINBERG, Arch. f. klin. Chir. **168**:658, 1932.

The old idea that congenital and acquired cysts of the kidney are separate entities has been dispelled since the time of Küster, who was the first to believe that these cysts are present during fetal life. If the child continued throughout life with this anomaly, it probably was one that had not progressed very far during the child's intra-uterine life. Often, however, if the condition had progressed to any extent, the child died during its fetal existence. In this report, a case in which hydronephrosis was found at birth with polycystic formation in the kidney is described.

KOHN, Milwaukee.

MORBILLIFORM DISEASE OF THE NEWLY BORN. S. ROSENBAUM and CARL KRAUSPE, Jahrb. f. Kinderh. **131**:257 (May) 1931.

This disorder is characterized by the sudden appearance over the entire body of a maculopapular eruption, lasting one or two days. The most frequent prodromes are loss of weight, fever and catarrh of the respiratory tract. It occurs most often between the fourth and fourteenth day of life. The rash may spread, but rarely is there a relapse, and never vesiculation, hemorrhage or necrosis. Exanthems are seen on the hard palate. The lymph nodes are swollen. There is leukopenia with relative lymphocytosis. Influenza bacilli were found by culture of the secretions in seven of twenty-four cases, and hemolytic streptococci in eight. The latter were present in blood cultures in eight cases in which sepsis developed, and staphylococci in one case of sepsis. Rosenbaum regards the disease as an infection acquired from adults with "grippal" infections. It can be distinguished from measles, erythema toxicum, exanthem dyspepticum (Moro), eczema and other exanthems in sepsis. Nine of the observed twenty-seven patients died—all from sepsis. Sepsis may occur at the onset or as long as a week after the fading of the rash. Great stress is laid on the isolation of all newly born infants from adults with respiratory infection and from any source of pyogenic infection. Privatdozent Krauspe contributes a description of the histologic changes in the skin, which resemble those in measles. Excellent colored plates and a full bibliography are included.

CLAUSEN, Rochester, N. Y.

ENDOTHELASTHENIA IN HEMORRHAGIC DISEASE OF THE NEW-BORN. W. BAYER, Jahrb. f. Kinderh. **133**:222 (Oct.) 1931.

The method of demonstrating capillary weakness by means of negative pressure (Bayer: *Jahrb. f. Kinderh.* **128**:311 [Aug.] 1930; **129**:55 [Sept.] 1930) was applied in (*A*) nine cases of melena and hematemesis and fourteen cases of bleeding in the skin, with positive results; but in (*B*) thirteen cases of cephalhematoma and thirteen of vaginal hemorrhage, with negative results. Bayer believes that his concept of endothelial asthenia is justified, and that this condition is the essential underlying cause of bleeding in group *A*. The exciting causes are unknown—possibly a high carbon dioxide tension or low chloride content of the plasma, or local trauma. The best results were obtained by transfusion of blood; the injection of two proprietary blood coagulants was ineffective.

CLAUSEN, Rochester, N. Y.

CLINIC FOR DISEASES OF THE NEW-BORN: ITS DEVELOPMENT AND ITS PROBLEMS. JIRI BRDLIK, Časop. lék. česk. **70**:370 (March 13) 1931.

The author, on assuming the chair of pathology and therapeutics of the new-born and infants, reviewed the history of the department from the time that it was a part of the division of the diseases of women and children. He discusses the problems of feeding, cross-infection, housing, nursing care, segregation of nursing mothers and wetnurses, medical organization and research. For proper appreciation of pathology the student must be given the opportunity to study physiology and hygiene of the normal new-born infant. The advantages and possible disadvantages of division of the service into new-born, infant and older children is discussed. Active cooperation of the pediatrician and obstetrician is urged for the best progress and the ultimate well-being of the mother and the infant. STULIK, Chicago.

TREATMENT OF THE UMBILICAL CORD AND A SIMPLIFIED NAVEL CLIP. JORGEN LOVSET, Acta obst. et gynec. Scandinav. **12**:150, 1932.

The author reviews briefly the various methods of treatment of the umbilical cord, confirms the improved results obtained by the use of the clip treatment described by Sunde in 1929, and presents a modified clip which has added advantages.

With the clip treatment the control of hemorrhage is assured at the time the clip is put on and there is no fear of hemorrhage after the cord falls off. There is no greater risk of infection. The cord falls off on about the third to the sixth day, usually the fourth, and the navel is well retracted on the tenth day. Excoriation or rash on the surrounding skin or granulomas of the cord stump have not been seen with this treatment.

This clip is superior to others because it is lighter and smaller and so does not exert any traction on the cord stump, is not in the way when the child is bathed and does not get caught in the baby's clothing. In addition, it is so inexpensive that it may be used only once.

The clip is made from a strip of aluminum 0.75 mm. thick and 7 mm. wide, and when folded it is one third of its entire length, measuring 25 mm. The edges of the first two-thirds are turned up so that they do not cut the cord, and the third wing is used to fold over the clip and lock it. A special forceps is used to crush the clip, with a space of 7.8 mm. between the branches. The cord is cut about 3 cm. from the clip, and no dressing is used. SPIEGEL, Chicago.

Acute Infections

SKIN HYPERSENSITIVENESS TO HOOK WORM ANTIGEN. GEORGE W. BACHMAN and R. RODRIQUEZ-MOLINA, Am. J. Trop. Med. **12**:279 (July) 1932.

The author carried out experiments to determine the hypersensitiveness of the skin to hookworm antigen, to compare the intensity of the reaction of the skin before and after treatment and the sensitivity of the skin in various age groups and to test the specificity of the reaction.

In the experiments, injections were given intradermally to 2,392 persons. They found that in certain persons there was a marked cutaneous hypersensitivity to extracts of Necator americanus, and that in a large percentage of cases this hypersensitivity could be detected by the use of extracts of Ascaris lumbricoides. There was no significant difference between the percentage of positive reactions of the skin before and after treatment. Within the various age groups a marked difference was present below 12 months of age. In no case did an infant below 12 months of age give a reaction to the extract, even though the mother had a positive reaction.

The authors concluded that for practical application of the skin test in detecting the presence of Necator americanus the measurable characteristics were too variable, and that group reactions to the nematodes were not significantly specific.

BURPEE, Augusta, Ga.

WHOOPING COUGH—LABORATORY DIAGNOSIS. LOUIS W. SAUER, Illinois M. J. **61**:433 (May) 1932.

No other communicable disease is diagnosed with such uncertainty and tardiness or is so frequently left undiagnosed as whooping cough. Under existing circumstances, quarantine is seldom established until the patient whoops, i. e., after the period of greatest contagion has passed. The cough plate or culture method of diagnosis is valuable early in the disease, at a time when all other methods of diagnosis are negative or misleading. Proper exposure of the cough culture box is important. The best cough is of the expulsive type from the bronchi rather than from the throat. The two most frequent pitfalls are that plates are not coughed on well enough and that they are exposed too late in the disease.

BARBOUR, Peoria, Ill.

SERUM SENSITIVENESS AFTER TOXIN-ANTITOXIN: A CLINICAL AND LABORATORY STUDY. LOUIS TUFT, J. Allergy **3**:235 (March) 1932.

In a controlled group of 100 patients who had not received horse serum, 4 per cent had a slightly positive cutaneous reaction and 1 per cent a markedly positive one. In a group of 227 patients who had received toxin-antitoxin, 27.9 per cent gave a positive reaction; in 18.7 per cent of them the reaction was moderately or markedly positive. The sensitization occurred in tissues other than the skin and more often in patients having a family history of sensitivity.

It is felt that when there is a history of horse serum having been given or a positive reaction of the skin in a patient needing medication with serum, a serum not derived from a horse should be used. If this is not available, the horse serum can be given in doses of 0.05 cc., the dose being gradually increased at intervals of from one-half to one hour and being given in conjunction with from 0.3 to 0.5 cc. of epinephrine hydrochloride (1:1,000) administered at intervals of two hours until the last dose is given. From 0.025 to 0.50 Gm. of ephedrine sulphate should be given from three to four times a day to prevent a delayed reaction.

HOYER, Cincinnati.

A TRIAL OF TOXIN-ANTITOXIN FLOCCULES (TAF) IN IMMUNITY AGAINST DIPHTHERIA. HAROLD K. FABER and MARY I. PRESTON, J. Pediat. **1**:34 (July) 1932.

One hundred and seven children who previously had given positive reactions to the Schick test were studied after one injection of toxin-antitoxin floccules had been administered. This preparation is a suspension in physiologic solution of sodium chloride of a precipitate formed from the mixture in optimal proportions of diphtheria toxin and diphtheria antitoxin. Schick tests done seven months (average) after injection gave 92.5 per cent negative reactions. Of eight children who continued to give a positive Schick reaction after receiving toxin-antitoxin, seven gave negative Schick reactions after one injection of toxin-antitoxin floccules. No local or general reactions of any kind were observed. The danger of serum sensitization is reduced to a minimum because the floccules are washed free from serum in preparation. Because of their stable properties the floccules withstand storage and transportation well and require slightly longer time for immunity than toxoid or toxin-antitoxin. The authors conclude that the toxin-antitoxin floccules have greater immunizing power than toxin-antitoxin and equal or better immunizing power than toxoid, with advantages over both.

LEMASTER, Evanston, Ill.

PARANASAL SINUSES IN SCARLET FEVER. A. C. SILVERMAN, J. Pediat. **1**:58 (July) 1932.

Roentgen examination of the sinuses was made in 292 patients with scarlet fever. In the series 91 per cent showed shadows designated as "hazy to opaque," and in only 9 per cent were the sinuses reported as clear. All of 33 patients with otitis showed abnormal sinus shadows, while no patients with clear sinuses had any aural complications. The clinical diagnosis of sinusitis in children is not easy except in those that show swelling of the lids; hence the addition of roentgen evidence should be of importance.

Without desiring to draw unwarranted conclusions in the absence of control studies, the author raises the question whether sinus involvement in scarlet fever is not the rule rather than a complication.

LEMASTER, Evanston, Ill.

CLINICAL ASPECTS OF RHEUMATIC FEVER IN CHILDHOOD. HERBERT N. VERMILYE, M. Clin. North America **15**:1287 (March) 1932.

Rheumatism in childhood must be considered from the standpoint of a general disease. Its dissociation into heart disease, chorea, arthritis and the like belies its clinical integrity. Acute rheumatic fever is a disease made up of a series of episodes or attacks. The first of these practically always occurs in childhood. The primary attack does not usually produce cardiac damage, but as subsequent attacks occur, the damage becomes cumulative. Since the foundation for the more serious cardiac defects is laid during the first decade, early recognition and painstaking management of the disease in childhood are of supreme importance. The virus of rheumatism produces perivascular lymphoid infiltrations, nonsuppurating, involving the smaller capillaries, resulting in formation of connective tissue, most frequently affecting the myocardium, the serous membranes of the joints, the pleura, the pericardium and the peritoneum. Hence the protean manifestations of the disease. The formation of connective tissue occurs as a sequel to the first attack, so that it may be impossible to evaluate the damage done until some time has elapsed.

In the management of rheumatic children, determination of the activity of the disease is of the highest importance. For this purpose greater reliance is to be placed on temperature and leukocyte counts than on location and character of heart murmurs. Group studies have added much to scientific knowledge, but the rheumatic problem remains a problem of the individual.

SMITH, Ogden, Utah.

THE BACTERICIDAL POWER OF ANTITOXIN AND ITS LIMITATIONS. F. HERB, M. J. & Rec. **135**:365 (April 20) 1932.

Two clinical proofs are given (1) that antitoxin kills the bacilli in the throat of the ailing child in successful cases, as they disappear from the throat simultaneously with the toxic symptoms; (2) that antitoxin given as a prophylactic measure kills the bacilli when they are settling—that is, kills them before they can grow and multiply. Animal experimental proofs have appeared in the literature from time to time. An attempt is made in this paper to furnish additional, more direct proofs bacteriologically. Three factors are at work in experiments of this kind, namely, the bacilli, the complement and the antitoxins. A short consideration of each is given in conclusion.

WILLIAMSON, New Orleans.

THE EPIDEMIC OF DYSENTERY-LIKE DISEASES IN CATTARAUGUS COUNTY, N. Y. DOROTHY G. WIEHL and MARY GOVER, Pub. Health Rep. **47**:1419 (July 1) 1932.

An investigation was made of an epidemic of mild gastro-intestinal attacks resembling dysentery which occurred in Cattaraugus County, N. Y., during the

summer of 1930. The source and type of the infection were not discovered. Thirteen hundred families were visited in both rural and village communities. About one fourth of the families were affected, and about one person in every seven. The greatest incidence was in August and September, and the greatest frequency was among young children. In 75 per cent of the cases the duration was only from one to three days. There were no deaths. The poorer families showed slightly higher incidence of attacks than the others. In almost half of the families affected more than one member was attacked.

LeMaster, Evanston, Ill.

Postvaccination Encephalitis. Charles Armstrong, Pub. Health Rep. **47**:1553 (July 22) 1932.

Postvaccinal encephalitis is discussed with special reference to prevention. The incidence is lowest when vaccination is done during infancy. In mice given injections of vaccine virus intracerebrally the mortality was found to be less in those that had previously received diphtheria toxoid. It is suggested that, especially after the first year of life, primary vaccinations should be deferred until after diphtheria immunization. The author supports the theory that the development of the child's immunity to one contagious disease tends to increase his resistance to others in a nonspecific way.

LeMaster, Evanston, Ill.

Immunization with Potent Unconcentrated Diphtheria Toxoid. R. A. O'Brien and H. J. Parish, Lancet **2**:176 (July 23) 1932.

From preliminary tests in a small series of cases the authors conclude:

1. Unconcentrated toxoids with an L. F. D. value from 28 to 36 are probably not more liable to cause reactions than those of half or one third this strength in wide use.

2. Subjects who react to the Canadian "toxoid intradermic test" are liable to suffer troublesome local or general reactions if given three full doses of 1 cc. of toxoid, but can in every instance be immunized without trouble by three full doses of toxoid-antitoxin floccules.

3. Rapid immunization follows the injection of three fortnightly doses of 1 cc. of potent toxoid.

Langmann, New York.

Involvement of the Nervous System After Varicella. A. B. Marfan, Nourrisson **20**:211 (July) 1932.

Neurologic sequelae are not infrequent after chickenpox. They may be peripheral or central, local or diffuse. Perhaps the most common involvement is the type resembling a mild form of poliomyelitis. Complete recovery usually ensues after several months.

McClelland, Cleveland.

Epidemiology of Measles. A. Dormidontow, Arch. f. Kinderh. **97**:148 (Sept. 9) 1932.

On Oct. 20, 1928, a wandering menagerie came to Wladimir. Many of the monkeys in the menagerie appeared sick, were coughing and showed catarrhal symptoms. From eight to sixteen days later, 254 children, all of whom had been near the monkeys, contracted measles. The prodromal stage lasted from four to five days. Almost all of the cases were mild. There was only 1 death, which occurred in a 1 year old infant. However, in the next few weeks measles developed in 499 other children, apparently from contact with children in the active stage of measles. In this group the course of the measles was much more severe, and there were 27 deaths.

LeMaster, Evanston, Ill.

FATE OF CHILDREN WITH THE SO-CALLED PRIMARY COMPLEX IN THE LUNGS. MARIA BODDIN, Arch. f. Kinderh. **93**:241 (June 16) 1931.

This contribution represents the study of one hundred and thirty-six tuberculous children over a period of from ten to twelve years. Of this number eighty-five of these children died, almost all of the fatal terminations occurring before from the seventh to the ninth year of life. The cause of death in most instances was a rapidly developing complication, such as meningitis, miliary tuberculosis or disseminated pulmonary tuberculosis, arising a short time after the original tuberculous infection. Death rarely occurred after the initial stage of acute tuberculous infiltration had been passed. These statistics indicate that if a child passes successfully through the first few months of a tuberculous infection, the prognosis for life becomes excellent. The physiologic changes during the years of puberty caused no unfavorable influence on the course of tuberculosis in this series of children, in contrast to the observations of many other authors. All of the fifty-one patients still living and well responded to the tuberculin test with a positive reaction, even though the tuberculosis was clinically and roentgenologically healed and the patients were carrying on their daily work normally. The calcified primary complex could be demonstrated in only seventeen of the fifty-one living patients.

LEMASTER, Evanston, Ill.

ARE THERE FORMS OR STAGES OF THE CAUSATIVE AGENT OF SYPHILIS OTHER THAN THE SPIROCHETE? F. JAHNEL, R. PRIGGE and M. ROTHERMUNDT, Dermat. Ztschr. **64**:7 (June) 1932.

From a review of the literature and from their own research, the authors conclude:

1. The syphilitic virus may be demonstrated in the organs of syphilitic animals by the inoculation of tissue into fresh animals, though microscopic examination of the organs fails to reveal spirochetes.

2. This observation is true during the primary and latent stages of manifest syphilis in rabbits, as well as in the asymptomatic syphilis of rabbits, guinea-pigs, white mice and white rats.

3. This does not necessarily mean that the syphilitic virus is present in an invisible form, but rather that the number of spirochetes present is so small as to make their demonstration extremely difficult. A variation of type of the spirochete certainly does not occur.

4. Filtration experiments rule out the possibility of a filtrable form of the syphilitic virus.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

THE IMPORTANCE OF CONGENITAL SYPHILIS FOR CHILD WELFARE BUREAUS. EDITH NEUMANN, Gesundhfürs. f. d. Kindesalt. **7**:93 (June) 1932.

It is well known that congenital syphilis may show a latency of three or more months. Without a history of infection in the mother, it is therefore impossible to make an early diagnosis. This is of great importance in deciding whether an infant should remain in an institution or should be given to a foster mother, not only because of the danger of infection to members of the foster home, but also because of the abortive and atypical cases which may be missed when the infant is only seen in an outpatient department.

Finkelstein has made it a rule that no infant should be discharged from his institution to a foster home before the end of the third month, and in twenty years he has not seen a case in which infection has been transmitted. The only objection to this plan is the increased cost due to the hospitalization of these infants who are otherwise normal.

REICHLE, Cleveland.

CIRCUMCISION TUBERCULOSIS. LAZAR FINKELSTEIN, Kinderärztl. Praxis **4**:155 (April) 1932.

Circumcision tuberculosis, which has been thought to be due to the sucking of the wound by the operator, may be due to droplet infection of the wound. In this method of infection, the clinical picture varies according to the number of organisms introduced and the resistance of the new-born infant; the severity of the disease seems to vary inversely with the length of the incubation period; i. e., the longer the incubation period, the milder the disease. In these mild cases conservative therapy is advised rather than the usual surgical intervention.

HUENEKENS, Minneapolis.

THE PATHOGENESIS OF TUBERCULOSIS OF THE SKIN AND OF TUBERCULIDS, INCLUDING LUPUS ERYTHEMATOSUS. O. KREN and E. LÖWENSTEIN, Wien. klin. Wchnschr. **44**:405 (March 27) 1931.

A blood culture should be made in every case in which tuberculosis of the skin is suspected, as it offers a direct confirmation of living virus in the blood. The indirect methods (complement-binding reactions, agglutination, precipitation) have failed completely in the clinic. It is also more reliable than the tuberculin reaction. The latter does not differentiate between active and inactive tuberculosis. The blood culture method is also more reliable than animal inoculations, and the results can be obtained more quickly.

The development of certain types of tuberculosis of the skin and of the so-called tuberculids is caused by living tubercle bacilli circulating in the blood. The result of the culture is determined by the developmental phase of the tuberculous focus. In occluded foci (lupus vulgaris, erythema induratum, granuloma annulare) a negative result may be obtained. The numerous positive culture results in lupus erythematosus suggest a tuberculous etiology of this disease.

The bacilli circulate in the blood as long as an active process exists in the organism. It is easier to obtain a positive culture in spring than in fall and winter.

ABT, Chicago.

ANSWER TO B. BUSSON'S NOTES ON THE BLOOD CULTURE OF TUBERCLE BACILLI IN CASES OF ACUTE RHEUMATIC FEVER. C. REITTER and E. LÖWENSTEIN, Wien. klin. Wchnschr. **44**:410 (March 27) 1931.

The authors point out several misinterpretations of Busson. In his notes Busson neglected the clinical side of the problem and considered only the bacteriologic aspect. The working hypothesis of Reitter (*Wien. klin. Wchnschr.* **41**:473, 1928), the etiologic connection between acute rheumatism of the joints and tuberculosis based on clinical observations, is changed by Busson into a theory. He plans a program of work for others, while his notes are not based on his own investigations, whether clinical or bacteriologic or by way of animal experimentation.

The proposal to use the rabbit's eye is unsuitable because bacilli of the human type possess a very low or even no pathogenicity for the rabbit.

ABT, Chicago.

THE PROBLEM OF TUBERCULOUS IMMUNITY. F. HAMBURGER, Wien. klin. Wchnschr. **44**:411 (March 27) 1931.

Hamburger does not agree with Löwenstein that only severely tuberculous guinea-pigs are immune to reinfection, but states that immunity develops soon after a primary infection. Löwenstein maintains that the immunity thus acquired is slight, but Hamburger states that the majority of subjects have only one primary complex during their lifetime and not several, which would be the case were Löwenstein's statements correct.

Hamburger also states that tuberculin allergy is a sign not only of past infection, but of relative immunity. Löwenstein's assumption that in reinfection the bacilli

appear very soon in the blood stream is correct only in cases of severe tuberculosis which do not possess any appreciable tuberculin allergy. This is not true of the large majority of cases, because in them the allergy is present. In reinfection the bacilli do not appear in the circulation in such quantities as in primary infection, but are held at the place of reinfection, according to Pirquet's law.

ABT, Chicago.

THE PROBLEM OF TUBERCULOUS IMMUNITY. E. LÖWENSTEIN, Wien. klin. Wchnschr. **44**:411 (March 27) 1931.

The author maintains that there is no fundamental difference between Hamburger's view and his own. Still he insists that tuberculin sensitivity and tuberculous immunity are entirely different concepts. He considers that tuberculin sensitivity is to be interpreted as a more or less reliable sign of infection. The purpose of the author's earlier report was to point out that his method of cultivating tubercle bacilli directly from the circulating blood opens a new way to the investigation of immunologic problems.

ABT, Chicago.

MANTOUX'S INTRACUTANEOUS TUBERCULIN TEST. S. URASHIMA and I. OHTA, J. Pediat., Tokyo, Nov. 20, 1932, no. 390, p. 2097.

The author reports the results of Mantoux tests performed on sixty-seven patients at the Nagasaki Pediatric Clinic. He found that the test was progressively positive as the patients grew older, and more positive results were seen in the warm than in the cold season. Of the cases diagnosed clinically, 65.9 per cent were positive, and 16.0 per cent showed no symptoms of tuberculosis.

KATO, Chicago.

Internal Diseases

THE BACTERIOLOGY OF BRONCHIECTASIS: AN ANALYSIS BASED ON NINE CASES IN WHICH LOBECTOMY WAS DONE. P. H. GREEY, J. Infect. Dis. **50**:203 (March) 1932.

The author concludes that there is no specific organism causing bronchiectasis, since he was able to recover many types of bacteria in nine cases of that condition in which lobectomies had been performed. His evidence is contrary to that of many investigators who claim that spirochetes are the etiologic factor in most instances.

TOOMEY, Cleveland.

CAN WE PREVENT HEART DISEASE? JAMES E. TALLEY, M. Clin. North America **16**:11 (July) 1932.

The prevention of heart disease through infection is contingent on the control of rheumatic fever and its related diseases, chorea, tonsillitis and scarlet fever. At least 80 per cent of heart disease occurring in children between the ages of 5 and 15 years is due to rheumatic fever. In England and Wales, the deaths at all ages from chorea and rheumatic fever were only 0.5 per cent of the total deaths, but for ages under 15, these conditions accounted for 18 per cent of the deaths.

Once a child is infected, the rheumatic process is persistent and widespread; it is sometimes dormant but rarely dead. It is not enough to recognize this infection in its classic manifestations. The condition must be suspected to exist in the presence of such symptoms as fatigue, pallor, loss of appetite and weight, poor sleep, a slight elevation of temperature, possibly sore throat, pain and general nervousness. Any child who has had polyarthritis or subcutaneous nodes, may be considered to have carditis as well. Therefore, to prevent cardiac involvement it will be necessary to make a tentative diagnosis of rheumatism before arthritis, subcutaneous nodes or chorea appear. Infected tonsils should be recognized and

removed before rheumatism becomes manifest. As with rheumatic infection, so with carditis, an effort should be made to determine from a minimum of symptoms, the existence of the condition. Slight fever and an increased pulse rate must be accounted for. A systolic murmur at the apex, with slight enlargement to the left, is practically sufficient to establish a diagnosis. A reduplicated second sound at the apex or a middiastolic whiff are confirmatory. If these signs are present, carditis is an established fact. However, with early diagnosis, family cooperation and long rest in bed, cure is still possible in many cases.

SMITH, Ogden, Utah.

THE CONTROL AND MANAGEMENT OF THE CARDIOPATHIC CHILD. EDWARD L. BENJAMIN, New York State J. Med. **32**:325 (March 15) 1932.

The cardiac clinic for children at the Lebanon Hospital, New York, has been in operation since 1921. In the past few years 950 children have been under observation, with between 70 and 80 new patients each year.

Cardiac disease was due to rheumatism in 189 cases, and in 43 families 2 or more members gave evidence of rheumatic carditis.

The clinic has followed the classification of the Association of Cardiac Clinics, but the most difficult problem is to classify the condition definitely and accurately as cardiac. Children should not be confined to the limited life of those with cardiopathic disorders until they have been carefully studied and observed over a period of time. When there is a history of rheumatism, all cardiac murmurs and other signs are of great importance and the condition should be classified as cardiopathic. Exercise tolerance tests are recommended, for children with cardiac conditions may develop "exercise phobia." Group examinations help to overcome this. These children are nervous and sensitive and require careful and sympathetic supervision. The home conditions must be understood, and the cooperation of the parents secured. The results in children's cardiac clinics are very satisfactory.

If a cardiac colony with a school could be established, the daily routine of such patients could be better controlled, and better results could be obtained.

AIKMAN, Rochester, N. Y.

THE DIAGNOSIS AND MANAGEMENT OF HEMOPHILIA IN CHILDHOOD. I. NEWTON KUGELMASS, New York State J. Med. **32**:660 (June 1) 1932.

All other hemorrhagic disturbances should be excluded before a diagnosis of hemophilia is made. A study of the literature by Bulloch and Fildes in 1911 authenticated only 44 hemophilic families of the 273 reported in the century. While hemophilia appears first at about 1 year of age, trauma at birth does not cause hemorrhage, and hemorrhagic disease of the new-born should not be confused with hemophilia. The umbilicus at birth is rarely a site of hemorrhage in hemophilia. The criteria necessary for diagnosis are: (1) hereditary origin; (2) limitation to males; (3) tendency toward repeated bleeding; (4) prolonged clotting time and normal bleeding time, and (5) deficient blood clotting function and defective platelets.

The prothrombin concentration is less than one third of the normal. The antithrombin is always more than three times the normal amount. The platelets are always normal in concentration, but the platelet disintegration value is less than 3.3 per cent, in comparison with normal blood in which it is greater than 50 per cent at the end of one hour. The one absolute criterion is the clotting index, which in hemophilia is less than one tenth of the normal.

Transfused blood even in small amounts (from 10 to 30 cc.) arrests hemorrhage in hemophilia, and a suitable donor should be kept available. The hemophilic child can undergo a surgical operation provided that a large transfusion of blood has previously been given. Locally, best results are obtained by the use of fresh human blood applied to the bleeding area. Human serum, tissue juice extracts

or fresh meat juice may also be so used. Cephalin is of value locally, but has no value when used by mouth or by subcutaneous or intramuscular injection. While the diet has but little if any effect, diets rich in visceral proteins are recommended.

AIKMAN, Rochester, N. Y.

THE FEMALE URETER—A NEW FACTOR IN THE INFECTIONS OF THE KIDNEY PELVIS IN WOMEN AND CHILDREN. A. I. FOLSOM, South. M. J. **25**:859 (Aug.) 1932.

The author calls attention to the anatomic and pathologic study made by Dr. George T. Caldwell of Baylor Medical College, which showed that a group of gland structures surrounds the posterior part of the female urethra; these are not simply mucous crypts, but distinct, definite glands that extend into the muscularis. Some of them seem to be of the branched tubular variety. He has found these glands in large numbers in anatomic and postmortem specimens showing varying degrees of inflammatory changes. The ducts in some have been closed, and the retained secretion gave them a cystic appearance on section.

The author believes that this group of rudimentary glands, situated around the posterior female urethra and opening into it, constitutes a definite focus of infection and can possibly explain to some extent the greater frequency of infections of the upper urinary tract in women.

SCHLUTZ, Chicago.

EXOPHTHALMIC GOITRE IN A CHILD. T. H. CROZIER, Brit. M. J. **1**:659 (April 9) 1932.

This report deals with a case in a girl, 6 years of age, who had a progressive swelling in the neck for several months. She was bitten on the cheek by a dog and frightened greatly, and afterward nervous manifestations developed.

ROYSTER, University, Va.

CHRONIC GASTRIC ULCER IN A BOY AGED THIRTEEN. MICHAEL OLDFIELD, Brit. M. J. **1**:836 (May 7) 1932.

The author reports a case of chronic gastric ulcer with acute manifestations. in which there were treatment by medical therapy and recovery.

ROYSTER, University, Va.

PYLORIC STENOSIS OF CONGENITAL TYPE ASSOCIATED WITH TETANY IN A WOMAN OF SIXTY-EIGHT. G. M. WAUCHOPE, Brit. M. J. **2**:100 (July 16) 1932.

A case is described in which a woman, aged 68, had attacks of illness accompanied by vomiting since the age of 15 years. When she came under observation she had several attacks, which were finally accompanied by the tetanic spasm. She was given treatment for this condition, but did not improve as much as it was hoped; therefore, an operation was performed and marked hypertrophy of the pyloric sphincter was discovered. The author thinks that this woman had a pyloric stenosis of the congenital type, probably beginning in infancy, though the history was not clear on that point.

ROYSTER, University, Va.

MILK-BORNE DISEASES. S. R. DOUGLAS, Brit. M. J. **2**:198 (July 30) 1932.

The author points out after careful investigation two classes of milk-borne infection: (1) that in which the milk becomes contaminated after it is drawn from the cow, for instance, the typhoid and the paratyphoid groups of fever, some epidemics of streptococcic and staphylococcic sore throats, and perhaps scarlet fever, and (2) that in which the causative organism actually infects the

cow and is excreted with the milk; this class includes bovine tuberculosis, undulant fever and, perhaps, certain epidemics of sore throat, scarlet fever and diphtheria.

Each of these groups is discussed briefly, and specifications are made as to the prevention of this condition.

ROYSTER, University, Va.

SEVERE ACUTE HAEMOGLOBINURIA IN A BOY. F. PARKES WEBER, Proc. Roy. Soc. Med. **25**:715 (March) 1932.

Severe acute hemoglobinuria was reported in a boy aged 3 years. He became ill during a walk, and on his return passed red urine. He was admitted to the hospital with a temperature of 103 F. and a pulse rate of 130, and he passed fruity urine the color of port wine. Otherwise no signs of disease were found. The boy had enjoyed good health previous to this attack. The family history and the results of the physical examination, urinalyses and examinations of the blood are given in the paper.

WILLIAMSON, New Orleans.

SUPRAPITUITARY CYST. J. H. GIBBENS, Proc. Roy. Soc. Med. **25**:722 (March) 1932.

A girl aged 5 years was admitted to the hospital because of attacks of headaches and vomiting which occurred every two to four weeks. There was no thirst, polyuria or ocular symptoms. The results of the physical examination are given in the report. The roentgen examination showed partial obstruction of the sella turcica, especially of the posterior clinoid process. The diagnosis of suprapituitary cyst was made. The child was then admitted to the hospital for operation, but the surgeon recommended high voltage roentgen therapy. The child did not improve.

WILLIAMSON, New Orleans.

OBESITY AND HIRSUTIES OF ADRENAL ORIGIN. A. G. MAITLAND-JONES, Proc. Roy. Soc. Med. **25**:722 (March) 1932.

This case was reported in a girl aged 12 years. The article is accompanied by a photograph showing a male distribution of pubic hair and striae atrophicae on the thighs, abdomen and breasts. On admission to the hospital, the patient weighed 104 pounds (47.2 Kg.) and was 4 feet and 4 inches (132.1 cm.) in height.

WILLIAMSON, New Orleans.

THE INFLUENCE OF THE SYMPATHETIC NERVOUS SYSTEM ON THE LARGE INTESTINE IN HIRSCHSPRUNG'S DISEASE. J. J. MORTON and W. J. M. SCOTT, Rev. franç. de pédiat. **8**:103 (Jan.) 1932.

By the use of spinal anesthesia in two cases of megacolon and also in animal experiments, the authors were able to produce a temporary motor activity in the colon. This leads them to believe that this anomaly is due to inhibitions of the central sympathetic nervous system affecting the large intestine. Spinal anesthesia, therefore, would offer a means of finding whether motor activity could be obtained; if so, sympathectomy should be of value.

SANFORD, Chicago.

FATAL COMPLICATION OF OCCULT BRONCHIECTASIS IN A CHILD TEN YEARS OLD. P. IACCHIA, Pediatria **40**:485 (May 1) 1932.

The author gives the clinical history of a child, aged 10 years, in whom a pyopneumothorax of spontaneous origin was completely cured following thoracotomy. After nine months of apparent well-being, pulmonary gangrene developed with metastatic abscesses in the spleen and in the brain, concomitant with purulent meningitis. Autopsy disclosed bronchiectasis, probably congenital, in the lower lobe of the right lung.

SIGNORELLI, New Orleans.

A Nervous Phenomenon Associated with Puncture of the Pleura. C. Sorrentino, Pediatria **40**:491 (May 1) 1932.

The author gives a review of the literature, as well as an account of his own experiences in which a so-called pleural reflex phenomenon was encountered. He points out that when these phenomena occur they are practically always fatal, and he advises that the possibility of their development should be kept in mind and should be explained to the families of the patients in all cases in which thoracic paracentesis is contemplated.

Signorelli, New Orleans.

Acute Erythremia of Normoblastic Type in an Infant. Giulio Lattes, Pediatria **40**:629 (June 15) 1932.

A case of acute erythremia is reported in this paper, with a detailed discussion of the important points in differential diagnosis, from both the clinical and the laboratory standpoint.

Because of the rapid course of the disease, with death occurring on the fifth day from the observed onset, attempts at therapeutic measures were impossible.

Signorelli, New Orleans.

Hemocytoblastic Syndrome Developing into Myeloid Leukemia in an Infant of Seven Months. Rina Simonetti, Riv. di clin. pediat. **30**:161 (Feb.) 1932.

An infant of 7 months was first observed on April 23; the complaint was digestive disturbance, stomatitis and swollen mammary glands. Studies of the blood were made at intervals as shown in the accompanying table.

Studies on the Blood of an Infant with Myeloid Leukemia

	April 30	May 3	May 6	May 9	May 12	May 15	May 18
Red cells (millions)	3.0	3.0	3.0	2.9	2.95	2.7	2,425
White cells (thousands)	30.0	35.0	80.0	130.0	200.0	260.0	350.0
Hemoglobin	45%	45%	40%	40%	38%	35%	30%
Polymorphonuclears	59%	46%	48%	54%	60%	45%	40%
Polymorphonuclear eosinophils	0.5	0	0	1	1	1	0
Polymorphonuclear basophils	3.5	0	0	0	0	0	0
Lymphocytes	14	14	14	17	9	13	11
Monocytes	1	0	0	2	5	3	3
Hemocytoblasts	16	14	10	4	1	0	0
Myelocytes	6	26	28	22	24	38	46
Nucleated red cells	2	0	1	0	0	2	0

The child died on May 20. Examination of the spleen and lymph glands confirmed the diagnosis.

Abstractor's Note.—The hemocytoblasts in the table are apparently myeloblasts.

Higgins, Boston.

Influence of Pilocarpine on the Number of White Cells and on the Differential White Cell Count in Normal Children and in Children Affected with Exudative Lymphatic Diathesis. P. Molteni, Riv. di clin. pediat. **30**:321 (March) 1932.

The author gave injections of pilocarpine in doses of from 3 to 8 mg. to twelve normal children, to fourteen children with exudative diathesis (eczema, especially of the scalp, and enlarged lymph glands) and to two children infected with hookworm and Ascaris. The children were between 6 months and 4 years of age.

There was no consistent reaction of the total white cell count to the injection, in either the normal or the pathologic cases.

In normal children the differential white cell count usually showed an increase in the percentage of lymphocytes, whereas in children affected with the exudative diathesis, there was an increase in the percentage of monocytes and of eosinophils. There was no striking change in the differential blood picture of the children with hookworm.

HIGGINS, Boston.

SYNDROME OF VON JAKSCH. JUAN VACHIER PALLI, Med. de los niños **33**:123 (May-June) 1932.

The syndrome of von Jaksch comprises splenomegaly, persistent leukocytosis and intense anemia with an increase in nucleated red cells. The various etiologic theories are discussed, such as parasitic syphilis and malaria, microbic (tuberculosis) and toxic. The anemia due to goat's milk resembles that of von Jaksch. The clinical forms of this disease are discussed.

DWYER, Kansas City, Mo.

PYELITIS IN EARLY INFANCY. WALTER PIAGGIO GARZON, Med. de los niños **33**:169 (June) 1932.

The author gives in this article the conclusions drawn from an exhaustive review of the subject extending through five numbers of the journal with remarks on the use of iopax in pyelography and the use of bacteriophage and vaccines.

DWYER, Kansas City, Mo.

PNEUMONIA IN CHILDHOOD: II. WHAT FACTORS INFLUENCE THE PROGNOSIS OF PNEUMONIA? R. KOCHMAN, Arch. f. Kinderh. **96**:14 (March 4) 1932.

This is a statistical study of the influence of (1) the type of pneumonia, (2) preexisting conditions, (3) the complications and (4) the type of treatment on the prognosis of pneumonia in childhood. The death rate for patients with lobar pneumonia in the first year of life was the same as that for those with the lobular form, about 40 per cent; for those between 2 and 4 years of age, lobar pneumonia has a mortality of 14 per cent and lobular pneumonia, 33.3 per cent. As would be expected, measles, whooping cough and severe rickets affect the outcome adversely. Otitis media complicating pneumonia has no appreciable effect on the mortality, whereas empyema, and particularly pericarditis, do. The author is opposed to any routine medication, particularly the giving of digitalis. Patients do best who are treated symptomatically and disturbed as little as possible. The use of fresh air is advocated.

LESLIE, Evanston, Ill.

THE INDICAN TEST ON THE URINE AND ITS PERFORMANCE IN INFANCY. E. MAYERHOFER, Arch. f. Kinderh. **97**:17 (July 22) 1932.

The author reviews the experimental work done on indican and allied products of intestinal putrefaction appearing in the urine. He states that glycuronic acid can unite with all the basic elements formed by intestinal putrefaction and that it is excreted in the urine in a combined form. The glycuronic acid reaction in the urine is a much more reliable test of intestinal putrefaction than the indican test.

LEMASTER, Evanston, Ill.

VISCOSITY STUDIES IN INFANCY: I. THEORY AND METHODS. JULIUS SURÁNYI, Arch. f. Kinderh. **97**:59 (July 22) 1932.

This contribution consists of a discussion of the physical properties of colloids and of the factors influencing the viscosity of the blood. Various methods used in studying the physical properties of the blood are explained.

LEMASTER, Evanston, Ill.

RESERVE ALKALINITY OF THE BLOOD IN RELATION TO DEVELOPMENT OF CARDIAC DECOMPOSITION. N. A. KEVDIN and F. P. LOPATSCHUK, Deutsches Arch. f. klin. Med. **167**:44, 1930.

In healthy persons the reserve alkalinity of the blood is usually between 48.1 and 60.5 carbon dioxide per cent by volume; occasionally it is as low as 45.3, and it has been found as low as 42.4. In persons with cardiac decomposition the reserve alkalinity is usually normal or nearly normal, even in severe cases. Occasionally hypercapnia or hypocapnia was observed, but with little regularity; the latter was more frequent. This indicates that determination of the alkalinity reserve of the blood during rest does not establish the functional capacity of the heart. In decompensation, slight physical exercise was followed by fatigue, while the alkaline reserve underwent the same changes as for normal persons following marked physical exertion.

KUGELMASS, New York.

A SEVERE HEMORRHAGIC DIATHESIS IN A 1½ YEAR OLD CHILD BENEFITED BY INTRAMUSCULAR INJECTIONS OF CALCIUM AND BLOOD. LADISLAUS GOLDSMITH, Dermat. Wchnschr. **94**:198 (Feb. 6) 1932.

In a 1½ year old boy severe purpura developed. The condition cleared rather rapidly under the influence of intramuscular injections of a calcium gluconate solution along with injections of whole blood.

TAUSSIG, San Francisco. [ARCH. DERMAT & SYPH.]

RETROPERITONEAL TERATOMA. C. FROBOESE, Frankfurt. Ztschr. f. Path. **43**:222, 1932.

The tumor was found at autopsy in a girl 1½ years of age. The reason for the publication of the report was the presence of anterior hypophyseal hormone in the urine. The author quotes Zondek as having stated that this is the first demonstration of this hormone in a patient with a benign tumor.

SAPHIR, Chicago. [ARCH. PATH.]

ROUND CELL INFILTRATIONS WITHIN THE SUPRARENALS. J. SOOS and E. RUSZKÓ, Frankfurt. Ztschr. f. Path. **43**:340, 1932.

Round cell infiltrations were never found in the suprarenal cortex in infants and in young Hungarian pigs. They neither constitute normal findings nor are present congenitally. They may be present in cases of intoxication, of infectious disease and of any diseases which may heal without leaving remnants. Even though they are sometimes found in cases of sudden death, it is more likely that they represent the result of a slowly developing chronic disease within the suprarenals, and therefore they should not be brought in correlation with an acute disease. The author believes that small hemorrhages, necrosis of cortical cells or lipoid changes produce a round cell infiltration. The most common location of such round cell infiltrations is the zona reticularis. Their purpose is the carrying away of cellular débris, but they cannot be regarded as blood-forming foci.

SAPHIR, Chicago. [ARCH. PATH.]

ALLERGIC DISEASES IN CHILDHOOD. LUCIE ADELSBERGER, Kinderärztl. Praxis **3**:97 (March) 1932.

Comparing allergic diseases in children and in adults, the author emphasizes the gradual development of antibodies in young infants, the greater tendency to infections of children and the increased permeability of their mucous membranes. The external factors are more simplified in young children, owing to their confinement to a few rooms and their comparatively simple diets. The greater frequency of anaphylactic shock in infants and young children has not been sufficiently emphasized.

The specific diagnosis is made from the family and personal history, cutaneous and intracutaneous tests and experiments with the diet. Therapy has two objects, to remove the offending foreign substance and to desensitize the patient. Because of the great rôle that infections play in allergic conditions in childhood, the author favors attempts to remove foci of infection. When dust is an important specific factor, prolonged sojourn in the mountains is advised. Nonspecific treatment with tuberculin is sometimes of value. Even with the cessation of all symptoms, a guarded prognosis should be given.

HUENEKENS, Minneapolis.

TREATMENT OF GONORRHEAL VULVOVAGINITIS OF CHILDHOOD. LUDOLF HEROLD, Kinderärztl. Praxis **3**:103 (March) 1932.

During the past ten years, the Düsseldorf Pediatric Clinic has used 18 different methods in the treatment of gonorrheal vaginitis in 244 children. The following treatment has been found to be the most effective: A glass apparatus, with an inflow opening larger than its outflow opening, is introduced into the vagina. A weak potassium permanganate solution in a container 3 feet (91 cm.) above the patient, is allowed to flow into the vagina, ballooning its entire mucous membrane. This is done for ten minutes every day and varied every third day with the administration of 1.025 per cent solution of silver nitrate. The method depends for its success on the pressure which stretches the vaginal folds.

HUENEKENS, Minneapolis.

A CASE OF GASTRIC HYPERSECRETION IN EARLY INFANCY. GEORG MEYER ZU HÖRSTE, Monatschr. f. Kinderh. **54**:65, 1932.

The author reports the case of a 10 week old infant brought to the clinic in a state of malnutrition following severe vomiting. From the results of clinical examination the writer questioned the diagnosis of pyloric stenosis. Repeated aspiration of the contents of the stomach showed a delayed emptying time, greatly increased secretions and increased acidity. The delayed emptying time was confirmed by roentgen examination. The patient's mother was neurotic, and on that basis the author made a diagnosis of gastric neurosis.

The reviewer cannot see the difference between the symptomatology in this case and in the usual cases of pylorospasm.

GERSTLEY, Chicago.

CONGENITAL FIBROUS MYOCARDITIS. C. FROBOESE, Virchows Arch. f. path. Anat. **284**:861, 1932.

The author gives a brief description and discussion of a case of fibrous myocarditis of the right ventricle in a girl 6 months old. There were no other cardiac abnormalities. He believes that the fibrotic process was the result of infection, which occurred either in the first few weeks of life or before birth. The child had had an attack of dyspnea shortly after birth. The author inclines to the view that the process had its origin in intra-uterine life.

SCHULTZ, Chicago. [ARCH. PATH.]

INTESTINAL INFANTILISM (CELIAC DISEASE). O. TEYSCHL, Časop. lék. česk. **69**:1557 (Nov. 14) 1930.

The author's two cases are the first reported in Slavic children, and to date no case in a Latin child has been reported. The author reviews the clinical and laboratory findings and cites his cases in detail. One child died of an acute glomerulonephritis and nephrosis, and the other child is doing very well on a diet low in protein. This boy, at 4 years was given a diet as follows: in the morning, three bananas, one orange and 10 Gm. of almond milk; at 10 a. m., two bananas and two apples or oranges; at noon. 100 cc. of soup made from a beef cube, 20 Gm. of rice, from 20 to 60 Gm. of scraped liver with 5 Gm. of butter

and 200 Gm. of cooked vegetables and 200 Gm. of raw vegetables with oil and lemon juice; in the afternoon again, four pieces of fruit and in the evening 250 Gm. of scraped fruit with 10 Gm. of ground nuts, a tablespoonful of oatmeal and a tablespoonful of cream and, in addition, from 100 to 200 Gm. of cooked vegetables. On this diet the stools became formed and the general reaction improved so that in a month the boy gained from 9,800 to 12,300 Gm., and after a half year, that is, at 4½ years, he weighed 17,500 Gm. After sixteen months on this meatless, diet of low cereal content, with the gradual addition of graham bread, honey, marmalade and chocolate, the boy is doing well. The author discusses the metabolism of diets high and low in protein and the advantage of sun-irradiated ripe fruits and vegetables from the standpoint of vitamins and energy.

STULIK, Chicago.

ETIOLOGY OF PYURIA IN CHILDREN. Z. TEVELI, Orvosi hetil. **76**:376 (April) 1932.

In a few cases the etiology of severe pyuria was studied. In the majority of the cases, different types of colon bacillus were found. These strains seem to be distinct; they do not show any mutation from one form to the other. There does not seem to be any connection between the severity of the infection and the biologic properties of the organism. Strains that do not ferment saccharose may occasionally be the cause of severe pyuria. Such a strain was found in a case of colon bacillus septicemia. Strains that ferment saccharose, sorbose, sorbite and dulcite, but do not ferment adonit, usually are not found in healthy children and are the most common cause of pyuria. In three cases, a pseudodysentery strain was the etiologic factor.

ZENTAY, St. Louis.

A CASE OF RENAL RICKETS. N. FAXÉN, Acta pædiat. **12**:302, 1932.

The patient showed abnormal thirst at 2 years of age and was found to have renal insufficiency. At 12 years of age he excreted 3,000 cc. of urine per day, with a specific gravity of 1.005, albumin and numerous leukocytes. At 17 years of age, he weighed 77 pounds (34.9 Kg.) and measured 4 feet and 3¾ inches (13.1 cm.) in height. At 17½ years of age, at the time of the first complete examination, these measurements were essentially unchanged. There were extensive rachitic deformities of the bones. The urine failed to show a concentration above the specific gravity of 1.007 throughout twenty-four hours. The blood showed: nonprotein nitrogen, varying between 57 and 97 mg. per hundred cubic centimeters; creatinine from 7.5 to 10 mg.; calcium, from 5 to 5.6 mg.; phosphorus, from 10 to 12.5 mg., and p_H of 6.92. The patient died in uremia. At autopsy the bladder showed enlarged ureteral orifices; the ureters were dilated and tortuous; both kidneys were hydronephrotic and showed atrophy and focal hypertrophy of the parenchyma, with increase in interstitial tissue.

MCINTOSH, New York.

A THEORY OF THE ALIMENTARY ORIGIN OF HAY FEVER AND A DIET BASED ON THIS THEORY. C. E. BENJAMINS, Nederl. tijdschr. v. geneesk. **76**:539 (Feb. 6) 1932.

Though it was demonstrated as early as 1873 that hay fever is caused by an abnormal sensitiveness to pollen of grains, it is not yet ascertained in what way this sensitization takes place. Based on the results of experiments on guinea-pigs and on theoretical considerations, a theory of an alimentary origin of seasonal hay fever is proposed. The regular use of cereals and foods prepared from them is considered responsible for this sensitization. This has become evident from positive skin tests and from the good results of elimination diets. In a few cases, however, the results were disappointing, further investigations on a larger scale are necessary. Colleagues interested in this subject are invited to participate.

VAN CREVELD, Amsterdam, Holland.

Nervous Diseases

MONGOLIAN IDIOCY IN JAPANESE. ALBERT L. HILL, California & West. Med. **37**:192 (Sept.) 1932.

Mongolian idiocy rarely occurs in the Asiatic races. One case, in a Chinese child, has been reported; none has been reported in the Japanese race.

The author reports two typical cases of mongolian idiocy, in children 2 years and 15 months of age, respectively, in two unrelated Japanese families, in neither of which had there been intermarriage with the white race.

MARSHALL, San Francisco.

THE DIAGNOSTIC VALUE OF THE LEVINSON TEST. CHARLES R. MESSELOFF, J. Pediat. **1**:349 (Sept.) 1932.

The principles and technic of the Levinson test are discussed. On the spinal fluids of seventeen patients showing signs of meningeal irritation, six of whom had tuberculous meningitis, the tests were uniformly dependable. It is suggested that the test be considered negative, regardless of the ratio, if there are less than 1 mm. of precipitate in the sulphosalicylic acid tube and 5 mm. in the mercuric chloride tube.

LEMASTER, Evanston, Ill.

RECENT ADVANCES IN THE STUDY OF POLIOMYELITIS. E. W. SCHULTZ, J. Pediat. **1**:358 (Sept.) 1932.

This article consists of an excellent presentation of the present status of knowledge concerning the nature of the poliomyelitis virus and the trend of experimental studies on it.

The author's summary is as follows:

1. The evidence at present indicates that the virus of poliomyelitis is a true ultramicroscopic virus, probably less than 50 millimicrons in diameter.

2. The virus apparently does not yield to culture on lifeless culture mediums, but like other ultramicroscopic viruses is regenerated only in the presence of living tissue cells.

3. As an antigen the virus calls forth antibodies resembling antitoxins more closely than bacterial antibodies. This suggests that the virus may be an aggregate much simpler in composition than a bacterial cell.

4. The pathogenicity of the virus is restricted to man and certain species of monkeys.

5. The virus is highly selective in directing its attack, not only restricting its attack to certain hosts, but to certain special cells within these hosts. After reaching the olfactory bulb from the nasopharyngeal vault, it seems to travel exclusively by nerve axons to various levels of the central nervous system, apparently remaining in all stages of the disease in intimate association with nerve cells.

6. The immunity following recovery from poliomyelitis is of a solid and durable character. This may be determined in part by a persistence of some virus in the tissues of the person who has recovered.

7. There is evidence that a large percentage of the adult population has acquired an immunity to poliomyelitis by natural means, probably as a result of a subclinical infection.

8. The value of serum therapy continues to remain an unsettled question, the general impression being that it is of some value if used early enough in the disease.

9. In addition to human convalescent serum for therapeutic purposes, there has become available the serum of certain normal adults not known to have had the disease and also the serum of individual poliomyelitis-refractory animals which

have been subjected to injections of the virus over a certain period. The serum of individual sheep, goats and, especially, horses may attain an antibody value comparable to that of the average poliomyelitis convalescent serum.

10. The actual solution of the poliomyelitis problem seems to rest on a systematic active immunization of children and young adults by appropriate methods still to be worked out. Such preventive measures also call for some convenient, inexpensive and reliable means of detecting those who require artificial immunization.

LEMASTER, Evanston, Ill.

DIFFUSE SCLEROSIS AND MALFORMATIONS OF THE BRAIN IN A CHILD TWO YEARS OLD. KONSTANTIN LOWENBERG and D. MURRAY COWIE, J. Pediat. **1**:435 (Oct.) 1932.

The authors report the case of a white boy, 2 years old. The mental development attained during the first year of life was lost during the second year, and spasticity of the muscles developed. Polydactylism, syndactylism and secondary optic atrophy were found. Autopsy showed abnormally shaped convolutions and a peculiar rubber-like consistency of the brain. Histologically there were unspecific degeneration of the parenchyma of the brain, universal destruction of myelin in both gray and white matter, associated with a moderate glia cell response, perivascular accentuation and polymorphic glia fiber production. The interpretation of these findings is discussed, as well as the relationship of this condition to that in cases of diffuse sclerosis previously described. LEMASTER, Evanston, Ill.

SYDENHAM'S CHOREA: THE PRESENT STATUS OF TREATMENT. J. R. GERSTLEY and S. A. WILE, J. Pediat. **1**:458 (Oct.) 1932.

During the past five years about 150 children with chorea were treated in a special chorea clinic of the Sarah Morris Hospital and were observed periodically following discharge. Treatment with drugs was of little help aside from the temporary relief afforded by sedatives. Removal of foci of infection and the use of serum, a ketogenic diet and foreign protein therapy were disappointing. Rest and isolation proved to be the most valuable therapeutic measures. It is suggested that the solution to the problem may be found in prophylaxis.

LEMASTER, Evanston, Ill.

MENTAL HYGIENE IN THE SCHOOL. WILLIAM H. BURNHAM, Ment. Hyg. **16**:26 (Jan.) 1932.

This is a reprint of an address delivered by Dr. Burnham in 1912, recalled on the occasion of his seventy-sixth birthday. Burnham emphasizes the fact that most patients in sanatoriums and hospitals for mental diseases have received many years of intensive training in the public schools, and that the school system cannot entirely escape the responsibility of having formed in these persons improper habits of thinking and reacting. To the end that psychic education be more likely to succeed, he enumerates four principles of scholastic mental hygiene: 1. Children should be taught to be attentive; they should not be forced to display unnatural concentration, but allowance should be made for the natural lability of juvenile attention. 2. They should be taught orderly association, so that they may not be driven first into confusion and then into worry, anxiety or even obsession by their inability to associate ideas logically, sanely and proportionately. Violent interference with the child's normal associative processes by fatiguing drills, or by demanding quick answers under great pressure, must not be tolerated. 3. Wholesome outlets for emotional impulses should be provided rather than the introduction of a system for repressing these impulses. 4. Periods of rest should alternate with periods of work, the schedule being designed to coincide with the normal ebb and flow of attention in each case. Burnham deplores the exaltation of the disagree-

able, the idea that unpleasant tasks are good discipline. He hastens to assure the more orthodox pedagog that he is not trying to make school work easier but that he is rather trying to make it at once harder and more enjoyable.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

GROWTH FACTORS IN CHILD GUIDANCE. ARNOLD GESELL, Ment. Hyg. **16**:202 (April) 1932.

The mind, like the body, is a growing organism; behavior develops in accordance with laws of growth as inescapable as the laws of gravity. This process of mental growth is no metaphysical abstraction but rather a reality as concrete as nutrition. Of course one cannot see psychic growth as directly as one can note physical development, but the former expresses itself in patterns of behavior which become increasingly purposeful and increasingly complex. The growth of mind is not wholly determined by conditioned reflexes, by subconscious urges or even by habit, but rather by a process of maturation. It is from this standpoint—a relative and a dynamic one—that problems of child guidance must be viewed. One must not view the fabrications of a child aged 4 years in the same way that one looks on the lying of a boy aged 17. One needs a kind of "genetic patience," which will enable one to look sympathetically, understandingly and tolerantly on behavior problems that are a parcel of psychic immaturity. Gesell believes that adolescent children should be taught to recognize this growth process and to cultivate it as part of their personal philosophy. Life in this manner becomes less confused and more meaningful.

DAVIDSON, Newark, N. J. [ARCH. NEUROL. & PSYCHIAT.]

AN EPIDEMIC OF CHOREA IN A FAMILY. DONALD PATERSON and LOUIS J. HORN, Brit. M. J. **2**:893 (Nov. 14) 1931.

Three cases of chorea are noted in one family, in children aged 10 years, 8 years and 3 years and 4 months. These cases occurred close enough together to cause the author to assume that the rheumatic condition underlying the chorea had assumed epidemic proportions, and they supported the contention that rheumatism may be contagious in overcrowded conditions.

ROYSTER, University, Va.

OTITIC HYDROCEPHALUS: REPORT OF THREE CASES. C. P. SYMONDS, Brit. M. J. **1**:53 (Jan. 9) 1932.

In otitic hydrocephalus up to a certain point clinical evidence suggests a cerebellar abscess secondary to otitis media, but the cases reported were felt to be due to hydrocephalus without previous meningitis, extradural abscess or lateral sinus thrombosis. There appeared to be merely an excessive amount of spinal fluid. The most striking feature of this condition is the swelling of the optic disks. This with hemorrhage and exudate frequently amounts to several diopters. In cerebral or cerebellar abscess, on the other hand, the optic disks commonly show no more than a slight venous engorgement. The degree of swelling as met with in hydrocephalus is rarely seen in cases of abscess, and is then accompanied by extreme drowsiness and malaise.

In striking contrast, however, to the appearance of the fundi is the general condition of the patient. Between the attacks of headache and vomiting he is likely to be alert, lively and of good appetite. The patient with an abscess, on the other hand, generally looks and feels ill and is dull, constipated and without appetite. Lateral sinus thrombosis, however, associated with otitic hydrocephalus complicates the picture.

In cerebellar abscess localizing signs, most notably nystagmus toward the side of the abscess and incoordination in the use of the upper limb on the same side, are characteristic, as the common situation for abscesses is temporal and

cerebellar. "Word forgetfulness" is almost always found with a left temporal abscess, even when such an abscess occurs in a right-handed person. A right temporal abscess, however, is relatively silent, and the differential diagnosis from otitic hydrocephalus is more difficult.

Analysis of the spinal fluid gives the final diagnosis. In otitic hydrocephalus there are high pressure and normal fluid, that is, no excess of cells or protein.

The treatment is by lumbar puncture. Enough fluid should be removed at each puncture to bring the pressure to normal, and this should be repeated as long as there is evidence of increased pressure. Three cases are reported. In these cases, however, there was complicating lateral sinus thrombosis without any actual infectious process of the membranes.

ROYSTER, University, Va.

ACUTE ASEPTIC MENINGITIS. ADAM L. K. RANKIN, Brit. M. J. **1**:138 (Jan 23) 1932.

Two cases of what the author calls acute aseptic meningitis are reported. In one case there were more or less typical symptoms of some form of infectious meningitis. The spinal fluid was under pressure and contained 300 cells per cubic millimeter, 80 per cent of which were polymorphonuclears and 20 per cent lymphocytes. No organisms were found. The patient was treated for meningococcus meningitis.

The second case was similar, though there was not as large a number of cells and all were lymphocytes. No organisms were found. Judging by the case reports alone it is difficult for the author to call either case one of acute aseptic meningitis though what the condition was is not clear.

ROYSTER, University, Va.

MILD AND ABORTIVE TYPES OF POLIOMYELITIC INFECTION. A. GENTILI, Riv. di clin. pediat. **30**:1121 (Sept.) 1932.

In citing seven cases of his own and several cases from the literature, the author emphasizes the fact that in poliomyelitis, besides manifesting neurologic symptoms and signs, the patient shows symptoms and signs referable to other systems and organs.

The physician must bear this in mind if he is to diagnose correctly the mild and abortive types of poliomyelitis.

HIGGINS, Boston.

SPINAL FLUID IN POLIOMYELITIS. A. GHIO and A. RANNO, Riv. di clin. pediat. **30**:1159 (Sept.) 1932.

The authors report the physical, chemical and cytologic characteristics of the spinal fluid in ninety-six cases of poliomyelitis.

Predominance of lymphocytes over polymorphonuclear cells is the rule in poliomyelitic spinal fluids.

The sugar content in the poliomyelitic spinal fluid tends to be higher than normal. The higher sugar content was found in the specimens of spinal fluid in cases of bulbar involvement.

HIGGINS, Boston.

ALTERATIONS OF THE CAPILLARIES IN POLIOMYELITIS. A. FIORENTINI and A. JEMMA, Riv. di clin. pediat. **30**:1171 (Sept.) 1932.

The authors studied the capillaries of nineteen children with infantile paralysis at different periods following the onset of the paralysis. The capillaries of the skin of a paralyzed limb were compared with those of the skin of a nonparalyzed limb. The capillaries were observed as to appearance and number by the Müller microscope, and as to fragility by the Frontali modification of the Riva-Rocci method.

In the early weeks of the paralysis there is an increased number of capillaries, as might be expected from the redness of the skin. After several months there is a diminution of the number of capillaries. One or more years after the paralysis the capillaries are still fewer, as would be expected with the diminished circulation of the atrophied muscles; many of the capillaries showed dilatation at this stage.

Examination of the capillaries does not seem to offer help in determining the possibility of ultimate recovery of a paralyzed muscle.

HIGGINS, Boston.

THE NEURO-HYPOPHYSEAL SYNDROME IN "X-RAY BABIES." G. MECCA, Riv. di clin. pediat. **30**:1204 (Sept.) 1932.

"X-Ray babies" refer to infants born of mothers who received roentgen therapy during pregnancy. Such treatment may cause definite damage to the fetus.

The author reports a case in which the mother had received six roentgen treatments for fibroma of the uterus. The child, now 7 years old, showed microcephaly (the head was 45 cm. in circumference), small eyes, undeveloped brain and pigmented skin (brown) with round areas of vitiligo (from 0.5 to 2 cm. in diameter). The breasts were enlarged, and axillary and pubic hair was apparent. The child had not menstruated. She did not talk or walk. A roentgenogram of the skull showed almost complete obliteration of the sella turcica. These findings suggest that the roentgen irradiation had affected the development and function of the glands of internal secretion, especially the hypophysis.

HIGGINS, Boston.

THE MICROSCOPIC ANATOMY OF THE CENTRAL NERVOUS SYSTEM IN PINK DISEASE. CORNELIA DE LANGE, Jahrb. f. Kinderh. **136**:193 (Aug.) 1932.

Many of the histologic appearances in Swift's disease described as pathologic are probably normal. The author studied the brain and spinal cord of a patient, 11½ months of age, sick for four and one-half months. In the region of the tuber cinereum she observed diffuse increase of glia and small glial nodules, but no neuronophagy. The increase of glia was present only in small areas, irregular in distribution. Similar areas were observed in the basal ganglions, optic thalamus and dentate nucleus. The marrow of the left anterior central gyrus showed in places infiltration by small round cells. The spinal cord was normal. The peripheral nerves were not available for examination.

CLAUSEN, Rochester, N. Y.

NEUROSIS OF THE VEGETATIVE NERVOUS SYSTEM (FEER). G. STEINBACH, Jahrb. f. Kinderh. **136**:208 (Aug.) 1932.

In a boy, aged 6½ years, convalescent from chickenpox, scarlatinal rash and symptoms typical of Swift's disease developed. Following improvement for four weeks, more severe symptoms were noted. Marked changes in the electrocardiogram included a long R-S-T interval, with notable spreading of the waves, and an S wave with a long arc, concave upward.

CLAUSEN, Rochester, N. Y.

JUVENILE EPILEPSY WITH FLACCID PARALYSES. W. BIRK, Monatschr. f. Kinderh. **55**:28, 1932.

The author reports three cases in which attacks of flaccid paralysis occurred in infants aged from 9 to 12 months. Muscles of both the extremities and the face were involved. The duration varied from two to three days in the skeletal musculature and sometimes from eight to fourteen days in the musculature of the face. Following the attack there was complete recovery, and no change in reflexes or electrical reactions could be determined.

The writer suggests that these might have been atypical attacks of jacksonian epilepsy.

GERSTLEY, Chicago.

TREATMENT OF JUVENILE EPILEPSY WITH THE KETOGENIC DIET. OTTO BECK, Monatschr. f. Kinderh. **55**:47, 1932.

This study should be of considerable interest to American pediatricians. If the reviewer interprets correctly, the study was made by the professor of pediatrics of the German University of Tübingen while working at the children's hospital of Cleveland with Dr. Gerstenberger. This is a reversal of the custom which has persisted for many decades.

A study was made on the effect of the ketogenic diet in the treatment of epilepsy. The results, surprisingly, show that the ketogenic diet is of no greater value than the other forms of diet in this disease. Indeed it becomes dangerous at times, as one child receiving such a diet was thrown into a typical diabetic coma by a mild intercurrent infection.

GERSTLEY, Chicago.

EXAMINATION OF THE SPINAL FLUID IN THE DIAGNOSIS OF POLIOMYELITIS. F. PLANT, München. med. Wchnschr. **79**:1548 (Sept. 23) 1932.

There are a few points in the examination of the spinal fluid which help differentiate poliomyelitis from encephalitis following the infectious diseases or vaccination. The protein in encephalitis is slightly increased, whereas there is a marked increase in poliomyelitis. In encephalitis there is a dissociation between the cell count and the albumin content of the spinal fluid; that is, there is an increase in cells without a corresponding increase in albumin. No such dissociation occurs in poliomyelitis.

Only rarely is there a deviation from the normal sugar content of the spinal fluid in poliomyelitis. An increase in sugar occurs in epidemic encephalitis and a decrease in tuberculous meningitis.

The colloidal gold curve and mastic reactions are helpful in making a diagnosis. Several typical and atypical colloidal gold curves for poliomyelitis are charted. Typical curves are 120000000 and 244311000. Some fluids give a curve characteristic of meningitis, and others produced no change in the color of the best solutions.

The author points out that it is more important to estimate the total protein in the spinal fluid than the globulin. In poliomyelitis most of the protein is albumin, so that the globulin may be only slightly increased when the total protein is markedly increased.

BRAHDY, Mount Vernon, N. Y.

Diseases of the Ear, Nose and Throat

END RESULTS IN TONSILLECTOMY BY ELECTROCOAGULATION DUE TO IMPROVED TECHNIC. J. A. HAIMAN, M. J. & Rec. **135**:471 (May 18) 1932.

The electrocoagulation of tonsils with the bipolar tonsil electrode is under the definite control of the operator and therefore may be regarded as a true, scientific procedure. Constant duplication of end-results can be obtained, with the elimination of heretofore existent dangers of coagulating the peritonsillar vessels. Bipolar electrocoagulation permits the removal of all of the tonsillar tissue and affords end-results comparable to those of the orthodox surgical procedure. Tonsillectomy by electrocoagulation is a valuable contribution to rhinolaryngologic surgery.

WILLIAMSON, New Orleans.

AN EPIDEMIC OF VINCENT'S ANGINA. HAROLD J. HARRIS, New York State J. Med. **32**:138 (Feb. 1) 1932.

The author estimates that during a recent epidemic he treated about four hundred patients with Vincent's angina. He found that the intravenous or intramuscular use of sulpharsphenamine gave the best results.

AIKMAN, Rochester, N. Y.

VINCENT'S OTITIS MEDIA IN INFANCY. I. NEWTON KUGELMASS, New York State J. Med. **32**:272 (March 1) 1932.

Vincent's infection of one week's duration in a girl, aged 19 months, extended into both ears. Both drums ruptured spontaneously, and Vincent's organisms were found in the discharge from the ears. All local treatment failed to give results. Injections of neoarsphenamine were given once weekly. The nasal accessory sinuses became involved. A double mastoidectomy and adenoidectomy were performed, and the sinuses were treated with packs of solution of mild silver protein. In spite of all treatment, the child returned six months later with a discharge from the right ear, which showed the same infection bacteriologically. The tonsils were then removed.

The author believes that cases of Vincent's infection in the ear are missed because of failure to make bacteriologic examinations of the discharge. As in the case cited they cause irreparable destruction of body tissues.

AIKMAN, Rochester, N. Y.

VASOMOTOR RHINITIS FROM THE ENDOCRINE STANDPOINT. L. A. NELSON, Texas State J. Med. **27**:398 (Sept.) 1931.

Nelson presents a cursory review of the literature bearing on this subject and the results of treatment in twenty cases of his own. In selecting his cases he eliminated the cases of vasomotor rhinitis and hay fever in which the patients responded to therapy with calcium or with mineral acid. No attempt was made to separate the allergic from the nonallergic patients. Three groups were noted: (1) patients who showed a lowered metabolic rate and who were given thyroid, (2) patients with normal metabolic rates who showed a tendency to obesity, especially of the girdle type, and who were given pituitary (whole gland), and (3) the remainder of the patients, who were given parathyroid and calcium. Of the twenty patients fourteen had lowered metabolic rates and were relieved within from thirty-six hours to three days by thyroid; three patients with normal metabolic rates responded to pituitary (whole gland) therapy; three patients responded within twenty-four hours to the parathyroid-calcium therapy. In addition to the foregoing, ten patients with cedar fever, as determined by cutaneous tests, who did not have their metabolic rates determined were given the first two remedies without relief but responded to a mixture of thyroid, parathyroid and calcium, usually within forty-eight hours. Case reports illustrative of each of the groups are presented.

LUECKE, Dallas, Texas.

SUBMUCOUS RESECTION IN CHILDREN. R. E. WINDHAM, Texas State J. Med. **27**:859 (April) 1932.

This is a report of cases of submucous resection in children from 7 to 12 years of age who have been under observation about 6 years without development of nasal deformity. The structures about the nose, i. e., the orbits, the brain and the sinuses, are 95 per cent developed at 7 years of age, and submucous resection after that, when properly done, does not cause malformations. The technic of operative procedure and postoperative care are discussed.

LUECKE, Dallas, Texas.

TREATMENT OF NASAL INFECTIONS BY THE SUPER-KROMAYER LAMP. EDWARD JAMES DECK, Brit. J. Phys. Med. **7**:6 (April) 1932.

The author describes methods for the treatment of the common cold, chronic nasal catarrh, rhinitis, hay fever, lupus of the nasal mucosa and unhealthy conditions of the nasal cavities existing after the removal of nasal polypi with the Super-Kromayer Lamp (British Hanovia Company). He claims beneficial results.

HARTMAN, Cleveland.

LOCAL ANAESTHESIA FOR TONSILLECTOMY. J. W. COSTELLO, Brit. M. J. **1:** 839 (May 7) 1932.

The author, an advocate of local anesthesia in tonsillectomy, describes his experience in a small series of cases.

ROYSTER, University, Va.

OTORHINOLARYNGOLOGY AND PEDIATRICS. H. ROUECHE, Arch. de méd. d. enf. **35:**450 (Aug.) 1932.

The author stresses the close accord that should obtain between these medical specialties; he enumerates the common problems that present themselves at the bedside, and discusses the interdependence that clinical studies develop. Particularly is this true in cases in which operative procedures may be indicated and in which joint responsibility is assumed by the physician and the surgeon. The particular problems discussed by Roueche include the management of tonsillar tuberculosis, the advisability of tonsillectomy in secondary infections, the treatment of habitual vomiting from stenosis of the esophagus, the differential diagnosis of lymphocytic meningitis following otitis media and tuberculous meningitis and the proper procedure in frank sinus infections in young subjects.

AMESSE, Denver.

PSEUDOMEMBRANOUS RHINITIS. G. SALVADORI, Arch. ital. di otol. **42:**512 (Nov.) 1931.

After having observed four cases of pseudomembranous rhinitis in children from 4 to 12 years of age, Salvadori reaches the following conclusions: There are two clinical forms of pseudomembranous rhinitis; one is diphtheritic, and the other is caused by the common genus of pyogenic bacteria (Staphylococcus, Streptococcus or Pneumococcus). It is difficult to establish the differential diagnosis of these two clinical forms in the early stages of the disease because the predominance of either the diphtheritic bacillus or the pyogenic cocci is determined by several conditions of a lowered resistance of the nasal mucosae and by other particular conditions of the environment. Rhinoscopic examination does not permit one form to be distinguished from the other, because in both forms thick and adhesive pseudomembranes are present. The clinical picture may give important signs for differential diagnosis because the lesions in the pyogenic form are less extensive than those in the diphtheritic form and the evolution of the pyogenic form is more rapid and more benign than that of the diphtheritic form. The results of bacteriologic examination have a relative diagnostic value because they should have certain relations to the general and local symptoms. For the differential diagnosis of these two forms one may resort to the treatment *ab juvantibus* with antidiphtheritic serotherapy because, although the pyogenic form improves and is even cured by the local antiseptic treatment, the diphtheritic form shows no modification under local treatment and recedes only under antidiphtheritic serotherapy. Therefore, in order to reach a diagnosis, especially in doubtful cases, one should resort to antidiphtheritic serum in an early period of the disease. The failure of serotherapy to cause a favorable modification of the evolution of the disease, as well as the results of bacteriologic examination, points out the presence of the pyogenic form, the treatment of which is local (the author used with good results gauze tampons soaked in a 1 per cent solution of protargol [strong silver protein], leaving them in the nasal cavities). As a prophylactic measure all cases should be considered as having a diphtheritic origin until it is proved that they do not.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

EXCHANGE OF CREATININE BODIES IN ADENOIDAL CHILDREN. U. AVELLONE, Pediatria **40:**457 (May 1) 1932.

This paper gives a report of rather detailed study of the relation between the production and the excretion of creatinine bodies in children with hypertrophy

of the adenoid tissues. The author found that in these children there is a peculiar pathologic creatinuria concomitant with a diminution of the creatine-creatinine exchange, which becomes modified and much diminished following the removal of the tonsils. It appears that this behavior of the exchange bears some relation to the pharyngeal tonsils and the hypophysis, most probably representing dysfunction of the latter as well as of other glands the function of which depends on it.

SIGNORELLI, New Orleans.

DEVELOPMENT OF THE FRONTAL SINUS IN THE INFANT AND ITS SURGICAL APPLICATION. R. BOMPET, Rev. med. (Buenos Aires) **17**:623 (Feb.) 1932.

The author believes that the frontal sinus presents certain distinct characteristics in the infant as well as in the adult, the pathologic condition depending somewhat on the age. In the adult the frontal sinus is more frequently affected than the maxillary. This is even more true in the child because of the late formation of the frontal sinus. The origin of the frontal sinus is in the anterior ethmoid cells. In a series of roentgenograms taken on children from 6 months to 18 years of age, the author found that the time of the appearance of the frontal sinus was between the ages of 6 and 8 years. Frontal sinusitis should not therefore be diagnosed before the sixth year.

SANFORD, Chicago.

SPONTANEOUS HEMORRHAGES OF TONSILLAR REGIONS. T. SKOOG, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **130**:206 (Jan. 21) 1932.

Skoog reviews the literature and divides spontaneous tonsillar hemorrhages into three groups, namely, (1) hemorrhages due to septic processes in the tonsils and adjacent tissues, (2) hemorrhages associated with localized ulceration of the tonsils and (3) truly "spontaneous hemorrhages." Under type 1, three of his own and thirteen other case histories are given, followed by detailed discussion of the literature. Skoog believes that surgical intervention is necessary in this type of hemorrhage, since even in a mild case prognosis as to future hemorrhages is impossible. He cites several cases in which life did not seem endangered but in which, despite careful observation. death occurred before hemostasis could be accomplished. Therapy should be suited to the individual case, but under all circumstances ligature of the common carotid artery should be avoided if possible, as the mortality associated with this procedure is very high, especially in the septic conditions under discussion, in which pyemia, septic embolism and septic thrombosis impend. If the source of the hemorrhage has been definitely located in the region of the external carotid, one may limit oneself to ligature of this vessel. In all cases the first measure should be ligature of the external carotid artery (except when the hemorrhage is definitely from another source), but in addition a loose ligature should be placed around the common carotid, and the ligature let out of the wound, which, in the event of hemorrhage, may be constricted immediately. By this therapy, the unnecessary danger of ligature of the internal carotid artery may be avoided and a provision for hemostasis made. In the second group of hemorrhages, including those of syphilis, tuberculosis and cancer, where life is not directly threatened, Skoog thinks that general therapy suffices. In a brief discussion of group 3, the truly "spontaneous hemorrhages" due to such generalized diseases as hemophilia, hypertension, renal disease and vicarious menstruation, the author points out the danger of confusion with gastric or pulmonary hemorrhage.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

INFLUENCE OF FOODS ON TONSILS. J. SAWATARI, Ztschr. f. Hals-, Nasen- u. Ohrenh. **30**:228 (Dec. 18) 1931.

Sawatari makes a contribution to the question of the function of the palatine tonsils in the digestive process. That the tonsils have a part in this process he

assumes on the basis of: (1) the numerous lymphocytes discharged into the buccal cavity from the tonsils, (2) the presence in the intestinal wall of lymph nodes morphologically similar to the tonsils and (3) the fact that the tonsils discharge lymphocytes that hasten the activity of ptyalin in the saliva, while the lymph nodes of the intestinal wall discharge lymphocytes that stimulate the digestive function of the pancreatic secretion. The author reports the experimental study of the effect of nutritional substances on the microchemical and morphologic structure of the tonsils and the lymph nodes of the intestine. The experiments were conducted on rabbits. The author finds that the tonsils of rabbits undergo progressive or regressive changes according to the type of food received. There is a marked increase or decrease in the emigration of lymphocytes from the tonsils, depending on increased or decreased lymphopoiesis. All these changes are paralleled by changes in the intestinal lymphoid tissue. The specific changes in the tonsils, which occur in hypertrophy as well as in regression, are dilatation of the blood vessels, infiltration of the pseudo-eosinophilic leukocytes in the follicle and their emigration to the crypts. This manifestation points to a condition of irritability in the tonsils. The author poses the question why the sensitivity of the tonsil, which exists normally to a slight degree, is greatly increased by hunger or by an abnormal diet. While admitting that the question requires further research, he believes, on the basis of his studies, that the function of the tonsils as a protective agent in the digestive process has a wider scope than that ascribed to it.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

FUNCTION OF HEALTHY AND DISEASED TONSILS. H. HOEPKE, Ztschr. f. Laryng., Rhin. (Teil 1: Folia oto-laryng.) **22**:1 (Dec.) 1931.

To understand what is meant by a diseased tonsil, Hoepke says, one must understand the function of the normal tonsil, and to understand that one must decide whether the lymphoid nodules are to be considered germinal centers or reaction centers against penetrating inflammatory and toxic irritants. To answer this question he made a comparative histologic study of normal lymphoid tissue in animals awakened from hibernation and of diseased tonsils immediately after tonsillectomy. On the basis of his investigations he thinks that the lymph nodules in the normal unirritated tonsil are germinal centers producing lymphocytes, but that when the tonsil is irritated, which occurs frequently because of its location, the germinal centers become reaction centers which decrease or discontinue the production of small lymphocytes to produce phagocytosing, reticular cells. Production of small lymphocytes is left to other parts of the tonsillar tissue. One cannot call the germinal center the normal condition and the reaction center the diseased condition, because the lymphatic tissue is able to react to many forms of irritation. The nodules can be germinating or reaction centers, according to need. The tonsil becomes a menace only when it must be a reaction center for too long. It requires a period of rest, a change from reaction to germinating center from time to time.

EDITOR'S ABSTRACT. [ARCH. OTOLARYNG.]

ROENTGEN IRRADIATION OF ADENOID VEGETATION. ZDENEK BENES, Časop. lék. česk. **69**:1495 (Oct. 31) 1930.

The author administered irradiation to a series of 138 patients over a period of two years. The only untoward results were a slight infiltration of the regional glands and slight pharyngeal hyperemia or a mild angina lasting only a few days. Both acute and chronic adenoid vegetations were treated. In all, 1,660 irradiations were given, and the immediate result was an improvement in respiration; 14 patients did not return for a check-up after the second irradiation, and these are not cited in the following figures. In 73 cases (mostly in children from 3 to 8 years of age) a complete cure was obtained; in 32 (children of from 10 to

14 years), improvement was obtained and in 19 it was not. In those in whom improvement occurred the entire reaction improved, even the facial expression. The treatment is especially recommended for recent or acute adenoid vegetations.

STULIK, Chicago.

EXOSTOSIS CARTILAGINEA MULTIPLEX. H. M. BROUWER-FROMMANN, Maandschr. v. kindergeneesk. **1**:325 (April) 1932.

The author gives an extensive description of a case of exostosis cartilaginea multiplex in a boy of 10 years.

VAN CREVELD, Amsterdam.

Diseases of the Skin

DERMATOSES IN CHILDREN. BERNARD L. KAHN, Arch. Pediat. **49**:512 (Aug.) 1932.

The writer discusses possible causes for the diseases of the skin at this age. Some of the more common diseases of the skin are described and treatment for each form suggested.

WADDELL, University, Va.

THE TREATMENT OF HEMANGIOMAS. IRA I. KAPLAN, Arch. Pediat. **49**:548 (Aug.) 1932.

It is urged strongly that angiomas or birth blemishes should be treated as early as possible after the birth of the child. The writer believes that the best and most effective cosmetic results are obtained by irradiation, and that radium therapy is the best form of treatment. Treatment can be given as early as three weeks following birth of the child, but must be applied only by one experienced in irradiation therapy.

WADDELL, University, Va.

HERPES ZOSTER (REPORT OF A CASE OF THE PALM AND TWO FINGERS AND FIFTEEN OTHER CASES, TREATED WITH PITUITRIN). HENRY D. NILES, New York State J. Med. **32**:773 (July 1) 1932.

Herpes zoster is a self-limited disease, but its course is shortened and the severe pain, which so often accompanies it, is usually rapidly relieved by injections of pituitary.

AIKMAN, Rochester, N. Y.

A WARD OUTBREAK OF ERYTHEMA NODOSUM. NORMAN D. BEGG, Brit. J. Child. Dis. **29**:193 (July-Sept.) 1932.

Many persons now look on the nodose eruption as the exanthem of tuberculosis, a cutaneous reaction occurring at the onset of tuberculin sensitivity in a susceptible person.

In a group of thirteen children convalescing from whooping cough, one developed miliary tuberculosis and died. Eight days after the death of this child, typical erythema nodosum of the forearms and legs developed in one of the remaining children. In three other children similar nodose eruptions developed at intervals of from seven to ten days, supporting the specific infection view.

All four patients showed strongly positive Mantoux reactions ($\frac{1}{100,000}$ mg.) and also positive Dick tests. Roentgenograms of the lungs suggested some degree of involvement of the hilar glands.

LANGMANN, New York.

BROMODERMA OF THE NEW-BORN; EXPERIMENTAL CUTANEOUS REACTIONS. SEZARY, LEFÈVRE and HOROWITZ, Bull. Soc. franç. de dermat. et syph. **39**:508 (April) 1932.

In a 7 months old infant who had been given a bromide mixture a bullous dermatitis developed. Skin tests were performed as follows: A scratch test was made on one arm, a 100 per cent solution of sodium bromide being used and a

physiologic solution of sodium chloride as control, and intradermal injections of each solution were made on the other arm. At the site of injection a red papule developed quickly, but vanished entirely within twenty-four hours. On the other hand, a papule did not appear at the site of scarification until three days later, and it was followed on the seventh day by a bulla conforming in every respect to the bullae of the eruption. The "cutireaction" was thus more reliable than the "intradermoreaction," and proved beyond doubt the culpability of the bromide.

GANDY, Houston, Texas.

EPITHELIOMA, LUPUS AND PITYRIASIS ROSEA IN A CHILD OF TEN YEARS. M. B. SAAD, Bull. Soc. franç. de dermat. et syph. **39**:552 (April) 1932.

This case is placed on record because of the extreme youth of the patient (10 years) in whom a prickle cell epithelioma developed in lupus tissue, the diagnosis being incontestably established by microscopic examination. A classic case of pityriasis rosea was likewise present.

GANDY, Houston, Texas. [ARCH. DERMAT. & SYPH.]

IS CHRONIC PRURIGO OF HEBRA IN INFANTS ASSOCIATED WITH CONGENITAL SYPHILIS. M. MANICATIDE and A. RUSESCO, Rev. franç. de pediat. **7**:356 (Oct.) 1932.

Four cases are given as examples to show that these two conditions are associated. In all these cases treatment for the syphilis caused an amelioration of the symptoms. The authors therefore believe that any long-standing case of pruritus in infancy should be seriously considered as syphilis, and that the old idea that syphilis can never be accompanied by pruritus must be revised.

SANFORD, Chicago.

ANGIOKERATOMA MIBELLI. FRANCESCO LISI, Gior. ital. di dermat. e sif. **73**:747 (April) 1932.

The author reports five typical cases of this condition in young subjects. Of these, four were associated with acrocyanosis. The patients were all tall, thin and weak. No endocrine disturbance could be found, although in all cases there was a certain degree of vagotonia. Capillaroscopy showed the vessels of the corium to be tortuous, dilated and congested, which leads to the belief that there is primarily a circumscribed dilatation of the venous tracts of the papillae. Histologically, this appears to be the case. Dilatation of the deep venous plexuses was also found, together with slight sclerosis of the deep veins. Dilatation of the lymphatic vessels is interpreted as secondary. The author concludes that angiokeratoma Mibelli is not a tuberculid but a capillary angiodystrophy, probably of toxic nature.

PARDO-CASTELLO, Havana, Cuba. [ARCH. DERMAT & SYPH.]

RELATION BETWEEN ECZEMA AND THE URIC ACID DIATHESIS. A. PASINI, Gior. ital. di dermat. e sif. **73**:1013 (June) 1932.

Taking the normal uric acid content of the blood as between 1.5 and 3 mg. per hundred cubic centimeters, the author investigated uricacidemia in eczematous patients with a purin-free and a purin-rich diet. In the first instance the uric acid of the blood often was as low as 1.15 mg. per hundred cubic centimeters and was never above 3 mg. In the second instance there was no marked increase in the uric acid, which was seldom above 3 mg.

From 300 to 600 mg. was taken as the normal amount of uric acid eliminated in the twenty-four hour specimen of urine. The patients on a purin-free diet eliminated as little as 150 mg. and never more than 500 mg., while those on a purin-rich diet eliminated from 300 to 600 mg. in twenty-four hours. From these results it appears that a purin-free diet in eczematous patients results in a diminu-

tion of the uric acid of the blood, but a purin-rich diet does not result in a marked increase. Also the elimination of uric acid in the urine is reduced under a purin-free diet, but it is not at all increased under a purin-rich diet.

The introduction into the blood stream of a solution containing 1 Gm. of uric acid resulted in a 50 per cent increase of the uric acid content of the blood in forty-eight hours. The elimination in these cases was not parallel to the increase in the blood. There was therefore an apparent retention of uric acid in the tissues. This retention was supposed to occur, in great part at least, in the cutaneous tissues. Nevertheless, the chemical examination of pieces of skin removed from eczematous patients under the foregoing conditions did not show this supposed retention of uric acid. On the contrary, many patients proved to have a lower uric acid content of the cutaneous tissues than those given a purin-free diet. Without arriving at definite conclusions, the author states that his experiments do not prove that uric acid acts on the skin as a specific allergen in the production of eczema.

PARDO-CASTELLO, Havana, Cuba. [ARCH. DERMAT. & SYPH.]

CUTANEOUS REACTIVITY OF ECZEMATOUS PATIENTS TO AMINO-ACIDS AND OTHER END-PRODUCTS OF METABOLISM. G. SCOLARI, Gior. ital. di dermat. e sif. **73**:1083 (June) 1932.

This piece of research consisted in the practice of 6,000 cutaneous tests in one hundred and twenty-six cases of eczema, ninety-two of which were in adults and thirty-two in children. Sixty-two normal persons were used as controls. The substances employed were practically all of the amino-acids isolated up to date, lipoids, fatty acids, guanidine, indoles, peptones, etc.

The results were all negative in adult patients, but in about four tenths of the children examined, positive eczematous reactions were obtained. Attempts to produce passive reactions by the Prausnitz and Küstner method ended in failure.

PARDO-CASTELLO, Havana, Cuba. [ARCH. DERMAT. & SYPH.]

DIFFUSE ANGIOKERATOMA OF THE LEG. A. H. ROFFO, Rev. méd. latino-am. **17**:1391 (July) 1932.

This is a report of a case of multiple angiomatous lesions of the calf of the leg in a child aged 7 years. The lesions had gradually increased in size and were hyperkeratotic. Treatment with radium was successful.

PARDO-CASTELLO, Havana, Cuba. [ARCH. DERMAT. & SYPH.]

TYPES OF GENERALIZED XANTHOMATOSIS. G. NOBLE, Dermat. Wchnschr. **94**:877 (June 25) 1932.

The author describes four cases of xanthomatosis which presented unusual features.

1. A woman, aged 46, had had xanthoma palpebrarum for six years. The lesions became hard and swollen with an associated enlargement of the nose, apparently periosteal in origin. The cholesterol content of her blood was always within normal limits.

2. A baby, aged 9 months, presented a massive enlargement of the liver and spleen in association with an extensive xanthomatosis of the skin, affecting chiefly the palms, soles and scalp.

3. A woman, aged 45, had suffered from jaundice and an enlarged liver for three years, during which time a generalized xanthomatosis developed. The cholesterol content of the blood varied from 250 to 310 mg. per hundred cubic centimeters on a normal diet.

4. In a man who had acquired syphilis twenty years previously, and who had been intensively treated for a recurrence, xanthomas developed on the elbows and palms. His liver was somewhat enlarged. The cholesterol content of the blood was 380 mg. per hundred cubic centimeters.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

AN EXTENSIVE CONGENITAL CUTANEOUS DEFECT OF THE SCALP. ERNA ZITZKE, Dermat. Ztschr. **64**:247 (Aug.) 1932.

A baby 9 months old was observed, who was born with the skin missing over a considerable portion of the scalp. Two older children of the same parents were normal. There was no evidence of syphilis. Two possible explanations are proposed: 1. The mother was a midwife and used her bicycle making calls during pregnancy, thus possibly causing intra-uterine trauma to the fetus. 2. The parents were cousins, and it is possible that consanguinity may have been the causative factor.

TAUSSIG, San Francisco. [ARCH. DERMAT. & SYPH.]

SALT-FREE DIET FOR THE MOTHER IN THE TREATMENT OF THE EXUDATIVE DERMATOSES OF NURSLINGS. RENATO PACHIOLI, Kinderärztl. Praxis **3**:54 (Feb.) 1932.

Excellent results are reported in four cases of erythroderma desquamativa in breast-fed infants. The nursing mothers were placed on a salt-free diet, with a resultant decrease of sodium chloride in their breast milk. The dermatoses cleared up in about two weeks, with no detrimental effect on the gain in weight and general nutrition of the infants.

HUENEKENS, Minneapolis.

TREATMENT OF CRUSTA LACTEA WITH VITAMIN A IN GENERAL PRACTICE. A. VAN GULIK, Nederl. tijdschr. v. geneesk. **76**:3035 (June 18) 1932.

Seventeen children with crusta lactea were treated exclusively with vitamin A and phosphoric acid. The diet remained unchanged. Twelve of them were cured within four weeks; in three of these a slight relapse occurred, which, however, was soon cured with the same treatment. In the rest of the cases no cause could be found for the failure of the drug.

The author is of the opinion that vitamin A acts favorably on the exudative diathesis in all its phases, and quotes an example. The vitamin A which is present in the skin should be protected against bright light, which can be achieved by the application of tar preparations.

VAN CREVELD, Amsterdam, Holland.

SEARCH FOR SPIRILLUM MINUS IN THE MOUSE IN RELATION TO THE DIAGNOSIS OF RAT-BITE FEVER. A. C. RUYS, Nederl. tijdschr. v. geneesk. **76**:3385 (July 9) 1932.

When rat-bite fever is suspected, the examination for spirilla must be performed in the following way: 1. Examination of blood serum obtained by irritating the wound, under dark-field illumination, or of preparations stained by Giemsa's method. 2. Examination of a thick drop of blood stained with Giemsa's solution. 3. Inoculation of the blood into mice, the peritoneal fluid of which had been carefully examined and found to be free from spirilla. By preference this inoculation must be done the day after the peak of the fever and, if possible, should be repeated. 4. The inoculation of mice with blood or serum obtained by irritation around the wound or from the exanthem. 5. Examination of the patient's serum as to its lytic action against spirilla.

VAN CREVELD, Amsterdam, Holland.

SIGNIFICANCE OF VITAMIN A IN ECZEMA SEBORRHOICUM INFANTUM. J. R. PRAKKEN, Nederl. tijdschr. v. geneesk. **76**:4521 (Sept. 24) 1932.

The author gives the results obtained in controlling the experiments of Kuipers (*Nederl. tijdschr. v. geneesk.* **75**:1108, 3439 and 3688, 1931) on the significance of vitamin A and hydrochloric acid in the treatment of eczema seborrhoicum infantum in twelve patients in the dermatologic clinic of the University of Amsterdam. Kuipers found a positive Carr and Price reaction in vernix caseosa. The author reports biologic experiments with rats (Professor Jansen), which demonstrate that vitamin A is present in vernix caseosa, in accord with the results obtained by Kuipers, who employed the color reaction. The Carr and Price reaction was

found to be positive in the scales of eczema seborrhoicum infantum in most cases, which is also in accord with Kuipers. A critical review is given of some of the experiments and conclusions of Kuipers. The treatment of the eczema seborrhoicum infantum with vitamin A, as indicated by Kuipers, proved a failure.

VAN CREVELD, Amsterdam, Holland.

Surgery and Orthopedics

ROENTGENOGRAPHIC MANIFESTATIONS OF INTESTINAL OBSTRUCTION. PAUL C. SWENSON and JAMES S. HIBBARD, Arch. Surg. **25**:578 (Sept.) 1932.

Recognizing the fact that the mortality in the surgical treatment of intestinal obstruction still remains alarmingly high and that the lowest death rate is obtained when the operation is performed soon after the obstruction occurs, the authors have presented their views on the value of roentgen examination of the abdomen as a means of early recognition of an obstruction. Experimental ileus was produced in thirteen dogs. After the desired series of roentgenograms was obtained, postmortem examinations were made on all the animals. Gaseous distention of the bowel, which can be detected roentgenographically, was found to be present, on an average, three and one-half hours following acute high mechanical obstruction. In low obstruction it was found to occur in three hours. Fluid levels were demonstrable in from three to four hours after the appearance of gas. With the experimental data used as diagnostic criteria, fifty-three clinical cases of ileus were reviewed, the roentgenographic findings prior to operation and the condition discovered at the time of operation being studied. It was found that on close inspection of the films the level of obstruction could be located much more closely than is generally considered possible. The authors conclude that in order to facilitate an early diagnosis, every puzzling case of acute condition of the abdomen deserves at least a flat abdominal film made with the patient in the supine position. From such a picture a valuable diagnostic point may be determined, namely, the relatively abrupt disappearance of the striae in the shadow of the distended jejunum as it approaches its junction with the ileum.

KAISER, Rochester, N. Y.

THE TOXEMIA OF UPPER INTESTINAL OBSTRUCTION—ITS NATURE AND TREATMENT. HAROLD T. NESBIT, J. Pediat. **1**:447 (Oct.) 1932.

Obstruction of the upper bowel, aside from tumor masses and postoperative factors, occurs with a frequency of over 80 per cent during infancy and childhood. Nitrogen retention, alkalosis and hypochloremia are the characteristic chemical alterations in the blood. The high mortality of this condition can be lowered by early diagnosis and surgical intervention, combined with the administration of sodium chloride and dextrose solutions before and after operation, as indicated by the chemical changes in the blood. The author reports the clinical course and results of chemical examination of the blood in a 7 year old boy with acute duodenal obstruction due to an adhesive band.

LEMASTER, Evanston, Ill.

IODIZED TABLE SALT AND GOITER SURGERY IN DETROIT. ROY D. MCCLURE, Wisconsin M. J. **31**:519 (Aug.) 1932.

A short review of the changing attitude toward the use of iodine in thyroid disturbances is given. In 1925 its use was introduced into Michigan as iodized salt containing 0.01 per cent sodium iodide. This gives the consumer about 1 mg. a day. From 2 to 3 mg. a week prevents goiter; 10 mg. per week has been proved harmless.

The incidence of goiter in the Detroit schools has dropped amazingly since 1925. In 1930, more than eight times as much iodized table salt was shipped as of plain table salt. The number of thyroidectomies performed in Detroit

hospitals has dropped from more than 1,000 to 700. The routine use of iodine in this endemic goiter region seems of prophylactic value in all types of goiter.

JANNEY, Milwaukee.

TORSION OF OVARIAN CYST IN CHILDREN. W. ARKLAY STEEL, Brit. M. J. **2:** 798 (Oct. 31) 1931.

The author's summary is as follows:

"1. Over twenty-five cases of torsion of ovarian cyst in children have been reviewed, and an illustrative case is given.

"2. Ovarian tumour, though rare, increases in frequency with the age of the child, and is most commonly met with between the ages of 10 and 14.

"3. Torsion, although very rare, is the commonest complication of these tumours.

"4. A correct diagnosis of the condition is decidedly more often the exception than the rule, in spite of the fact that a constant clinical picture is found in practically every case.

"5. The typical features present are: a history of similar but less severe attacks, the sudden onset of pain, an increase of temperature and pulse rate, the palpable abdominal tumour, with overlying tenderness and rigidity, and the tender cystic mass, which can be made out per rectum.

"6. The diagnosis is sometimes very difficult, the lesion for which torsion of a cyst is most often mistaken being an appendix abscess."

ROYSTER, University, Va.

CONGENITAL TALIPES EQUINO-VARUS. DENIS BROWNE, Brit. M. J. **2:**696 (Oct. 17) 1932.

The author discusses the nature of congenital talipes equinovarus, stating certain theories of its production, outlines the principles of the treatment and gives his own treatment.

ROYSTER, University, Va.

TREATMENT OF ADOLESCENT COXA VARA. GEORGE PERKINS, Brit. M. J. **1:**55 (Jan. 9) 1932.

The author discusses the various minor deviations from normal leading up to true coxa vara, the result of slipping. He stresses briefly persistent arthritis of the hip joint and summarizes the article as follows:

"Treatment for a slipping of the upper epiphysis of the femur may be summed up as follows:

"1. When the slipping is gradual and incomplete, relief of weight bearing must be maintained until the new position has been consolidated.

"2. When the slipping is rapid and complete, gradual correction should be done by skeletal traction, followed by relief of weight bearing until the new position is consolidated.

"3. When the sequel to the consolidation in the new position is an alteration in the arc of movement at the hip, leading to loss of function, a subtrochanteric osteotomy is necessary.

"4. When the sequel is a persistent arthritis of the hip, the hip-joint should be arthrodesed."

ROYSTER, University, Va.

TWO CASES OF TRAUMATIC DISLOCATION OF THE HIP IN CHILDREN. PHILIP GLYNN, Lancet **1:**1093 (May 21) 1932.

The dislocation is usually due either to a weight falling on the back while the subject is in some sort of squatting position or to a fall in which the child lands with the leg bent under the body.

In the first case, that of a child, aged 3 years and 11 months, there was a sciatic type of dislocation, the head of the femur lying in the great sacrosciatic notch. The dislocation was successfully reduced by Bigelow's circumduction method.

The other patient, a girl of 7 years, had a dislocation following a fall, the head of the femur resting against the posterior lip of the acetabular notch. This dislocation was also successfully reduced.

LANGMANN, New York.

1: AN INFANT WITH DEFORMED EARS. 2: LARGE OVARIAN CYST IN A GIRL AGED 8 YEARS. CECIL P. G. WAKELEY, Proc. Roy. Soc. Med. **25**:421 (Feb.) 1932.

1. A case of deformed ears is reported in an infant of 3 months; the report is accompained by pictures of both ears.

2. A girl of 8 years had been habitually constipated since the age of 5 years. On Nov. 20, 1931, she was seized with abdominal pain and vomited several times. This was followed by loose stools. Afterward the mother noticed a swelling in the abdomen. The child was sent to the hospital where she was found to have a large hard abdominal tumor, which was movable from side to side and slightly from above downward but could not be moved farther than the brim of the pelvis. The history was important in this case, as the cyst was within the pelvic cavity at first and was the cause of the constipation. The sudden rise out of the cavity caused the vomiting as a result of shock. On operation a large right ovarian cyst weighing just over 2 pounds (907 Gm.) was removed. The histologic report on the tumor is given.

WILLIAMSON, New Orleans.

GOOD COMPENSATION AND ONLY SLIGHT DEFECT OF SPEECH IN UNTREATED CLEFT PALATE. DOUGLAS GUTHRIE, Tr. Med.-Chir. Soc., Edinburgh, 1932, p. 14; in Edinburgh M. J., February, 1932.

A girl, aged 10 years, had not been operated on for cleft palate, though the harelip had been repaired in infancy. During her attendance at the Edinburgh Speech Clinic, her speech was found to be unusually good. The cause was found to be in the closure of the nasopharynx by a mass of adenoid tissue. This is an instance in which it was useful not to remove adenoids.

NEFF, Kansas City, Mo.

SOLITARY HEPATIC CYST. D. STEWART MIDDLETON, Tr. Med.-Chir. Soc., Edinburgh, 1932, p. 16; in Edinburgh M. J., February, 1932.

In a 7 year old girl, the edge of the liver, which was three fingerbreadths below the costal margin, merged into a large tense cyst filling the entire right hypochondrium. At operation the cyst proved to come from the lower surface of the right hepatic lobe. It contained white mucoid fluid. Such a solitary cyst is thought to arise from a portion of hollow bile duct which originates from the foregut. The duct becomes sequestered and distended by mucoid substance secreted from the glands in the wall. The child recovered.

NEFF, Kansas City, Mo.

SIMPLE LYMPHOMA OF THE ILEOCECAL VALVE. D. STEWART MIDDLETON, Tr. Med.-Chir. Soc., Edinburgh, 1932, p. 17; in Edinburgh M. J., February, 1932.

The author reports recurrent attacks of abdominal colic, near the umbilicus, in a girl 4½ years of age. Vomiting appeared during recent attacks, with discomfort in the right iliac fossa. At operation a tumor was found within the

cecum, attached to the ileocecal valve. The lymphoma resulted from hypertrophy of one of the lymphoid follicles of the colon. After resection of the right portion of the colon, the child recovered.

NEFF, Kansas City, Mo.

PAINFUL SPINE WITH KYPHOSIS IN ADOLESCENCE. M. MEYER, Rev. franç. de pédiat. **7**:285 (Oct.) 1932.

This condition is equally divided among members of the two sexes, and is usually at about the age of 12 years. The symptoms are pain in either the lower dorsal or the upper lumbar region. The percussion of all of the vertebrae elicits tenderness. The reflexes are sometimes exaggerated. The spine may assume a kyphosis that resembles that seen in Pott's disease. In examining 8,000 spinal columns at autopsy, Schmorl found many small fibrocartilaginous masses on either the superior or the inferior surface of the vertebra. These masses were found in 38 per cent of autopsies and may be a cause of the kyphosis. Another explanation may be vertebral epiphysitis. The disease is frequently thought to be Pott's disease, which may be ruled out by roentgenograms. Chronic rheumatism and congenital syphilis must be considered in making a diagnosis. The treatment consists of orthopedic and respiratory gymnastics, rest and heliotherapy.

SANFORD, Chicago.

DIAGNOSIS AND TREATMENT OF INTUSSUSCEPTION. C. PFEIFFER, München. med. Wchnschr. **79**:1638 (Oct. 7) 1932.

A boy, aged 8 years, had diarrhea for several weeks and severe pain in the right side of the abdomen for twenty-four hours. A diagnosis of intussusception was made. Air was injected through the rectum and observations were made with a fluoroscope. The air did not pass beyond the cecum. A long narrow shadow was seen extending into the proximal end of the ascending colon. The shadow disappeared as more air was injected. The child was well after the manipulation, but the following day there was slight tenderness in the right lower quadrant. Laparotomy revealed a mobile, edematous cecum and lower ileum. Fixation of the cecum and lower ileum was done and recovery was uneventful.

Another child, aged 1½ years, with a similar history was treated by the rectal injection of air. Laparotomy was not performed following the successful reduction of the invagination. The recovery was uneventful.

Pfeiffer recommends the injection of air for diagnosis and treatment of intussusception. It is painless and simple, but should be done only under observation with a fluoroscope.

BRAHDY, Mount Vernon, N. Y.

Miscellaneous

PITUITARY MEDICATION IN THE TREATMENT OF ABNORMAL MENTAL AND PHYSICAL CONDITIONS OF CHILDHOOD. LOUIS A. LURIE and J. VICTOR GREENEBAUM, J. Med. **14**:5 (March) 1933.

The authors believe that they have further evidence that pituitary medication has value in the treatment of physical and behavior disorders of children due to hypopituitary states.

In a series of twenty-five children, behavior difficulties were shown by eighteen, in fifteen of whom the difficulties were corrected and in two improved. There was a gain in height in all who showed skeletal undergrowth at the start. Four of the twenty children who showed marked adiposity lost weight, and those who gained in weight or remained stationary tended to lose the girdle type of fat distribution. Twelve of nineteen boys developed normal secondary sex characteristics. Such symptoms as thirst, bulimia, headache, enuresis and convulsions which were present only in the dystrophia adiposogenitalis type were corrected in seventeen cases, improved in one and unimproved in two.

The medication used was mainly whole pituitary gland given by mouth and an anterior lobe pituitary preparation given hypodermically. Extracts of the anterior or posterior lobes of the pituitary gland and thyroid extract were given occasionally.

NELSON, Cincinnati.

THE PRACTICE OF PREVENTIVE PEDIATRICS. A. GRAEME MITCHELL, West Virginia M. J. **29**:113 (March) 1933.

Although ignorance exists concerning many medical problems, if the present knowledge of preventive measures were universally put into practice, a tremendous amount of disease and suffering could be eliminated.

There are many correctible defects in the foundation, which threaten the superstructure. The nutrition of the child is well under the control of the physician.

Many deficiency diseases and some communicable diseases are so easily prevented as to be inexcusable, while others in the latter group present more difficult problems.

The various tests for susceptibility and the means available for preventive inoculations are discussed.

Mental hygiene and race hygiene are considered, and the urgency of measures to check the growing numbers of the degenerate, the feebleminded and the diseased is stressed.

In some cases, disease in the child can be prevented by treating the mother during pregnancy.

While artificial feeding under the expert supervision of the physician is much safer than formerly, still breast feeding when possible is imperative.

SHAWKEY, Charleston, W. Va.

THE PEDIATRICIAN AND THE PRIVATE PRACTICE OF PUBLIC HEALTH. R. H. PADEN, West Virginia M. J. **29**:120 (March) 1933.

The author discusses environmental sanitation, preventive treatment, nutrition of school children, periodic health examinations, immunization, education of the public as to healthy living and similar subjects.

The prevalence of rickets is noted, and in this connection, as causative factors are mentioned prolonged breast feeding, even up to 3 and 4 years of age, lack of the use of antirachitic preparations, the neglect of health examinations on the part of the parents, and in many cases the inadequacy and neglect of these on the part of the physician.

A survey of 42,219 school children showed 23.12 per cent of them to be 10 per cent or more under weight. Of these, the highest percentage in any one county was 57.9 and the lowest was 2. In the agricultural areas, 25.24 per cent were 10 per cent or more underweight; in the mining areas, 24.02 per cent; in the industrial areas, 20.74 per cent and in the mixed areas, 15.56 per cent.

In the United States, 22 per cent of urban and 7 per cent of rural children under 6 years of age have been inoculated against diphtheria.

There still occurs in the United States annually an average of 55,000 cases of smallpox, though vaccination has been known to the medical profession for one hundred and thirty-four years.

Responsibility for the education of the public in the matters of public health rests largely on the pediatrician because of his position of advantage in a practice limited to children.

This obligation can be met by giving instruction to individual parents, by lectures to groups, by reading papers in medical societies and by publishing articles in the medical journals, for the benefit of the general practitioners.

SHAWKEY, Charleston, W. Va.

PRIMARY AND NORMAL SCHOOL ORGANIZATION IN URUGUAY. EMELIO FOWNIE, Bol. Inst. internac. am. de Protec. a la infancia **5**:484 (April) 1932.

Primary education is compulsory in Uruguay for children beween 6 and 14 years of age; it is gratuitous, no matriculation fee being required and no books or other material being paid for in the public schools; secondary, normal and higher education is also gratuitous and nonreligious.

Primary and normal schools are mixed for boys and girls in all the grades; only a few schools are attended by boys alone.

The following are the different types of schools included in the organization: regular schools, kindergartens, schools of methods (which are annexed to the normal schools), practicing schools, open-air schools, seaside colonies, preventoria, schools for the deaf and dumb and for the blind, special schools for abnormal children, experimental schools, night courses for adults and private schools. The experimental schools are free, the curriculum, study hours and methods to be employed being adopted for their directors.

The student who aspires to become a teacher may either follow the regular course at the normal school or study independently, so becoming a free student. Teachers are of three degrees: first grade teachers (of elementary schools) and second and third grade teachers (of superior primary schools). A six year course of study is required for the first grade; no definite time is established for the other two. There are two normal schools in Montevideo and three in other cities of the country.

As a means of improving the professional condition of teachers, vacation courses in Montevideo and teachers' concentration courses in the rural districts are organized, the latter during the school year; furthermore, there are permanent fellowships established for study in Europe and in the United States.

All positions in the schools are obtained by means of competitive tests.

Mixed schools are directed by women teachers; boys' schools may be directed by either men or women.

Control of the schools is carried out by inspectors of various categories.

Annual examinations have been eliminated from the curriculum for school children and for normal students who have attended regularly and have obtained a minimum classification, being compulsory only for free students.

The school authorities comprise the following: the National Council of Primary and Normal Education; the departmental committees of primary instruction; technical, district and departmental inspectors, and also inspectors of practicing and private schools and of adult courses, and departmental subinspectors.

AUTHOR'S SUMMARY.

ILLUSTRATIVE CASES LEFT IN A CHILDREN'S DEPARTMENT. A. REUSS, Arch. f. Kinderh. **97**:13 (Oct. 4) 1932.

Four cases of idiopathic icterus gravis neonatorum beginning the first few days of life are reported. The association of icterus gravis and hemorrhagic disease is discussed. Four cases of icterus gravis of the septic form are reported, showing that this type begins later in the new-born period. Two infants showing icterus of the septic type and hemorrhagic symptoms recovered after a stormy course. The author reports the cases of two infants about 6 months old who showed osteomyelitis with very mild symptoms. Two children, 6½ and 10 years old, died of paratyphoid B infection within three days of onset; the atypical fulminative course of the disease did not suggest its true nature during life.

LEMASTER, Evanston, Ill.

Society Transactions

NEW YORK ACADEMY OF MEDICINE, SECTION OF PEDIATRICS

Clinical Meeting, Jan. 12, 1933

JOHN CAFFEY, M.D., *in the Chair*

ALIMENTARY GALACTOSURIA. DR. HOWARD H. MASON.

This article is to be published in full.

FAMILIAL OSSEOUS DYSTROPHY (MORQUIO'S DISEASE). DR. NORMAN R. COWARD and DR. ROSA LEE NEMIR.

Two children with an unusual form of osseous dystrophy associated with dwarfism are reported. Morquio, of Montevideo, in 1929, described a family of five children, four of whom showed this deformity. He believed that the disease had a definite familial basis.

The two patients here reported are brothers, born of Italian parents who are not consanguineous. The family history is without significance. There are three other children, two boys and one girl, who are normal.

The first patient, a boy of 10, was born with a "crooked left arm," which was put in a splint when the patient was 19 days old. The arm remained in a splint for six months. The child was apparently normal otherwise until he reached 2½ years of age, when the legs became bowed and he was no longer able to walk easily. This deformity of the legs progressed until the patient was 6 years old. The second deformity was a pigeon breast, which progressed and was associated with a definite kyphosis, which had appeared when the patient was 3½ years old. The child has not grown in height for the past five years and, in fact, has seemed to grow shorter. The arms also became deformed.

Physical examination revealed a boy who was definitely dwarfed and who had pronounced deformities of the chest, the spine and the extremities. His standing height was 46 inches, (116.8 cm.), as compared with 59½ inches (151.1 cm.) for a normal boy 10 years of age. He had a long, narrow face, a short, stocky neck, narrow shoulders and a marked pigeon breast. Dorsal kyphosis increased the anteroposterior diameter of the chest, which measured 27½ inches (69.8 cm.), as compared with 26½ inches (67 cm.) for a normal boy of 10 years. The trunk was greatly shortened by the kyphosis. The upper extremities were relatively long, with large, deformed elbows and flattened wrists. The fingers were long, narrow and very soft. There were well developed genu valgum and marked flatfoot. Although the muscular tone was weak, there was good muscular coordination. The joints were extremely hypermotile. The hands permitted such a pronounced degree of hyperextension as to allow the fingers to touch the forearm. The gait resembled a duck waddle. The remainder of the physical examination was unimportant.

Laboratory studies, including those of the blood calcium, the blood phosphorus and the basal metabolism, all gave normal findings. The Wassermann test of the blood gave negative results. The roentgen studies were interesting. The spine showed characteristic changes—flattened vertebrae with lateral and anterior bony exuberances and increased intervertebral spaces in the dorsal and lumbar segments. The upper half of each acetabulum was flattened and eroded. The epiphysis of

the femoral head was flattened. The chief findings in the other bones were osteoporosis, shortening of the fibulae and radii and fragmentation of the epiphyses.

The second patient, 5 years of age, a brother of the boy described, is the fourth child in the family of five. His birth and development were normal. When he was 7 months old, a deformity developed on his back, which required a back brace. When he was 3 years old, the deformity of the legs appeared; it has progressed to the present time.

Physical examination showed marked deformity of the spine, with less marked deformity of the legs. The patient was definitely dwarfed; the standing height was 38 inches (96.4 cm.), as compared with 44 inches (111.7 cm.) for a normal boy of 5 years. This dwarfism was largely due to a shortened trunk; the sitting height was four fifths of the normal measurement for a boy of his age. The other deformities were like those of his brother but were much less pronounced. Laboratory studies gave negative findings, and roentgenograms revealed the same pathologic conditions that have been described.

Both brothers showed a rare form of symmetrical osseous dystrophy, with dwarfism. Clinically the disease is characterized by bony deformities, chiefly kyphosis, pigeon breast and genu valgum. From a roentgenologic standpoint, the outstanding features are osteoporosis, shortening of the fibulae and radii and fragmentation and late closure of the epiphyses. The disease is believed to have a familial basis and is of unknown etiology.

SCLERODERMA AND SCLERODACTYLIA IN A CHILD. DR. PHILIP COHEN.

The patient is a girl, 13 years of age, with a history of diabetes and nephritis in the family. Her clinical history is irrelevant.

About three years ago, without any ascertainable cause, she became abnormally sensitive to cold. The finger-tips were involved first, then the toes, and later the hands and feet and the nose. On exposure to cold the fingers and toes quickly turned extremely white, as if all the blood had left them; there was an accompanying tingling, followed by pain. When the hands and feet became warmer they assumed a dusky reddish and purplish tint. The patient states that "the color was hard to get back." She came to dread cold and felt much better in the summer. A few months after the appearance of these symptoms dryness and tightness of the skin was noticed. She then observed that her fingers no longer turned white, but became purple instead. The fingers grew weak, and the patient complained of difficulty in performing prehensile movements. The condition grew progressively worse, the involved areas spreading from the fingers and toes to the arms and legs and from the face to the chest. The skin became smoother, firmer and more shiny and acquired a brownish color. Loss of substance from the fingers accompanied the same process in the skin and deeper tissues, leading to a clinical picture of sclerodactylia. Limitation of other movements was the next expression of this disease. For the last few months the patient has complained of pain in her thighs. There has never been any pain in the joints.

Physical examination revealed a smooth, shiny, atrophic, pigmented, hidebound skin. The movements of the fingers, arms and feet were distinctly limited; there was generalized atrophy of the muscles. There was obvious sclerodactylia, which was most marked in the fingers and the toes. The circulatory changes resembled those of thrombo-angiitis obliterans, the extremities being pale when elevated and dusky when pendent. A calcified nodule could be felt in the ball of the right thumb near the nail. Examination of the fundus revealed thin, tortuous vessels. The pulse of the left dorsalis pedis was never felt, but the artery on the right side at times gave a feeble pulsation. The blood pressure varied markedly, ranging from 80 to 126, systolic. The basal metabolism repeatedly revealed a high normal finding, varying from plus 18 to plus 26. The blood chemistry was normal in every respect, both organically and inorganically. Roentgenograms taken at intervals showed progressive osteoporosis and atrophy of the terminal phalanges; the calcareous nodule on the right thumb was visible, but no other nodules were

disclosed. Studies of the capillaries showed giant vessels, much diminished in number, greatly dilatated, especially in the venous end, and having a slow, almost static, circulation. Oscillometric studies showed a decreased volume.

Studies of the temperature of the skin gave the best index of the dermal circulation and revealed striking changes. The temperature of the skin of the fingers and toes was in the low twenties (C.) (low seventies [F.]), as compared with that of the trunk and face, which was 10 C. (18 F.) higher. With the induction of fever by radiothermy and following general anesthesia, the low temperatures of the skin of the hands and feet rose to the same level as the temperature of the other parts of the body. The rise to the normal level excluded an occlusive disease and pointed to an undue influence of the sympathetic nervous system, which fever and anesthesia obliterated. Warmth induced by local treatment, such as baking, had the same effects. Wheal formation is diminished in this disease. In this patient the vasodilating action of histamine was less than in a normal control, as was the vasoconstricting action of epinephrine. Wheal formation was also lessened following the introduction of morphine and atropine. It is significant that, while wheal formation was less than in normal conditions, it was not greatly diminished.

My studies in this case lead me to believe that scleroderma falls in the same category as Raynaud's disease. The primary involvement is in the capillaries, through the agency of the sympathetic nervous system. The early symptoms in this case are similar to the local asphyctic phenomena of Raynaud's disease. The vasoconstriction is followed by intense vasodilatation and vascular changes. Abolition of the action of the sympathetic nervous system brought about normal circulation in the skin. The progress of the disease was temporarily halted by physical therapy in the form of generalized baking.

THROMBOPHLEBITIS MIGRANS COMPLICATING ACUTE RHEUMATIC FEVER. DR. IRVING CLAMAN.

This patient, a boy, 13 years of age, was admitted to the Hospital for Joint Diseases ten and one-half months ago. One year before admission he suffered from a mild attack of acute rheumatic fever lasting one week. For three weeks previous to admission he suffered from a severe attack of acute rheumatic fever. During the third week the left lower extremity, beginning at the ankle, became progressively swollen, tender and edematous. On admission the saphenous vein was engorged with many hard, red, tender areas. The patient complained of severe abdominal pain. The right leg then became involved, but less acutely than the left one.

The abdomen was tender; the temperature was 101 F.; the systolic blood pressure was 130. The heart was slightly enlarged on the left side. There was a double mitral lesion, with aortic insufficiency. Extending from the upper border of the sternum downward and laterally to the wall of the chest on both sides and down the lateral aspect of the abdomen to the thighs in an anastomosing arrangement were engorged veins, some of them hard, but none red or tender. The periumbilical area was free. The patient became acutely ill, the temperature reaching 103 F. A blood culture was negative. Salicylates and sodium bicarbonate were given in moderate doses.

The edema of the legs and the venous engorgement subsided gradually during the following two and one-half weeks, and the patient made an uneventful recovery up to the time of discharge eight weeks later. The thrombophlebitis was thought to be of rheumatic origin, as it definitely complicated the severe attack of acute rheumatic fever. The abdominal pain was interpreted as having been caused by partial thrombosis of the inferior vena cava.

All forms of thrombosis are exceedingly rare in acute rheumatic fever. Venous thrombosis is rare and, when present, usually occurs in the lower extremities. In this case it was thought that the thrombosis starting in the left leg extended up

the deep veins to the inferior vena cava and down on the right side to the saphenous vein. The superficial varicosities of the wall of the chest took part in the collateral circulation.

There are still moderate enlargement of the left saphenous vein and engorgement, with tortuosity and varicosity of the superficial lateral veins of the chest. The patient has gained 45 pounds (20.4 Kg.) since leaving the hospital and has been leading the normal life of a schoolboy.

EXTENSIVE DECALCIFICATION OF THE BONES IN AN EIGHT YEAR OLD BOY. DR. ABRAM JOSEPH ABELOFF, DR. IRWIN PHILIP SOBEL and ADOLPH BERNHARD, B.S., M.A.

This article was published in the AMERICAN JOURNAL OF DISEASES OF CHILDREN, January, 1933, p. 105.

GLYCOGENIC HEPATOMEGALIA. DR. CARL ZELSON and DR. LOUISE RAUH.

The patient was an Italian male child, 26 months old, who was admitted to the pediatric service of Mount Sinai Hospital at the age of 20 months, with the history of a large abdomen which had progressively increased in size since the patient was 8 months old. The past history and the family history were without significance.

Physical examination revealed a moderately underdeveloped child with a very large abdomen. The liver was huge, the lower border extending about 5 cm. below the umbilicus in the right mammillary line and about 7 cm. below the costal margin in the left mammillary line. The physical examination was unimportant in other respects. Laboratory studies showed low blood sugar during fasting, low blood amylase, high blood cholesterol, an abnormal curve for sugar tolerance, acetonuria and increased urinary amylase. Tests of the hepatic function gave normal results.

On the basis of these findings a diagnosis of hepatomegalia caused by a disturbance in the glycogen metabolism was made.

GONOCOCCIC ARTHRITIS IN A NEW-BORN INFANT. DR. VIRGINIA LANGWORTHY.

The patient, a Negro male infant, was admitted to the New York Nursery and Child's Hospital on Aug. 29, 1932, at the age of 5 weeks, with a history of fever and a swelling of the right knee and ankle, which had begun about ten days before.

The patient's mother, a Negro woman, aged 26, had had five previous pregnancies, with four living children and one abortion. She had had some vaginal discharge for an indefinite period and a profuse discharge for two months before the birth of this infant. About three weeks before his birth the mother had become acutely ill with fever, chills and a painful swelling of the joint of the right ankle. The infant was delivered normally at term in Harlem Hospital, on July 25, 1932. The mother and infant left the hospital on the sixteenth day post partum, at which time the mother still had some fever and swelling of the right ankle, but the infant appeared normal. During the third week post partum an abscess developed on the medial aspect of the right ankle of the mother, which discharged pus for a week or two. The infant was in contact with the mother at this time, although he had not been breast-fed since the first week.

The infant's illness began at the age of 3½ weeks, with fever and swelling of the right ankle and then of the right knee. On admission to the hospital, at the age of 5 weeks, he was fairly well nourished and only moderately ill. His right ankle and knee were swollen, hot and apparently tender, and motion at these joints was restricted. No other abnormality was noted except a small bilateral hydrocele. No conjunctival or urethral discharge was present.

The infant's temperature, which was about 100 F. on admission, rarely exceeded 100 F., for about four weeks. The swelling over the right ankle became fluctuant

during the first week. It was incised two weeks after admission and discharged pus freely for about two weeks. Five weeks after admission the wound was closed, and only slight swelling remained about the joints. When the infant was 2 months old, the right knee appeared normal, but there was slight periarticular thickening, with slight limitation of motion of the ankle.

Laboratory studies made at the time of admission showed 3,900,000 erythrocytes, with 55 per cent hemoglobin, and 20,600 leukocytes, with 40 per cent polymorphonuclears. The Wassermann reaction was negative and the Mantoux test gave negative results with 0.2 mg. of tuberculin. Roentgenograms of the affected joints, taken at intervals during five weeks, showed periarticular infiltration but no involvement of the bones. The results of repeated urinalyses were negative, except during a period of diarrhea with dehydration (in the third week), when 2 + albumin was present. Blood cultures taken on admission and five and nineteen days later gave no growth. Pus aspirated from the fluctuant area over the right ankle twelve days after admission showed a few gram-negative cocci, both intracellular and extracellular, but aerobic cultures gave no growth. Pus aspirated from the same site six days later again showed gram-negative micrococci in stained films, and a growth of the organism was obtained on blood agar, incubated in a moist chamber containing 10 per cent carbon dioxide. This organism was studied in the New York State Laboratory at Albany and, from its cultural and agglutination reactions, was identified as the gonococcus. A further study of the culture by the complement-fixation reaction was made by Dr. Annis Thomson of the department of health of New York City. An antigen was prepared from this culture which was found to give as strong fixation with serums from persons known to have gonorrhea as was obtained with the stock (Torrey) gonococcus antigen. The infant's serum, taken six weeks after the onset of the symptoms, gave a 2 + reaction with the homologous antigen and a partial 1 + reaction with the stock gonococcus antigen. The serum of the infant's mother, taken about three months after the onset of her arthritis, gave a 1 + reaction with both the stock gonococcus antigen and the antigen prepared from the infant's culture. After repeated examinations, which were unsatisfactory owing to vaginal bleeding, a cervical smear was obtained from the infant's mother, which showed the presence of morphologically typical gonococci.

It is concluded that the infant had a gonococcic infection, which had probably been acquired from contact with the mother. The portal of entry of the infection was not determined.

LUMBAR SYMPATHECTOMY IN HIRSCHSPRUNG'S DISEASE. A REPORT OF THREE CASES. DR. EDWARD W. PETERSON and DR. ROGER H. DENNETT.

Hirschsprung, in 1886, described the disease which has since borne his name as a condition of "congenital high-grade dilatation of the colon, with thickening of all its tunics, especially the tunica muscularis, and retention of large quantities of fecal matter." The dilatation and hypertrophy may affect a part or the whole of the large bowel. To the cardinal symptoms—dilatation of the colon, abdominal distention and obstipation—may be added languor, apathy, loss of weight, anemia and general muscular weakness. Occasionally there may be abdominal discomfort, vomiting, fever and evidences of auto-intoxication. Usually when diarrhea occurs it is merely the overflow of fecal retention.

The treatment of idiopathic dilatation of the colon in the past, whether by medical or by surgical measures, has, for the most part, proved unsatisfactory. Following the work of Hunter (*M. J. Australia* **1**:86, 1924) and Royle (ibid., p. 77), of Sydney, Australia, Wade and Royle (*M. J. Australia* **1**:137, 1927) reported a case of Hirschsprung's disease which was treated by ramisection of the lumbar sympathetic ganglions, with excellent results. Judd and Adson (*Ann. Surg.* **88**:479, 1928), Rankin and Learmouth, of the Mayo Clinic (*Ann. Surg.* **92**:710, 1930; *Am. J. Surg.* **15**:219, 1932), Wade (*Lancet* **1**:136, 1930) and others later

gave encouraging accounts of their experience with this operation. No deaths were recorded. All cases, it seems, were benefited, and the end-results in properly selected cases were "spectacular" (Rankin). Three cases are here added to the growing list of satisfactory results following this use of sympathectomy.

CASE 1.—William L., 14 years of age, has shown obstipation since birth. Frequent purgatives, enemas and irrigations were always required to move the bowels. The boy never had a spontaneous bowel evacuation. The abdomen was distended and pendulous, and the colon was greatly distended. In July, 1931, the patient was admitted to the babies' wards of the New York Post-Graduate Medical School and Hospital for observation and study. While he was there, acute intestinal obstruction developed, and a surgical consultation was asked for. Dr. R. F. Carter saw the boy at this time and made the following note: "Temperature, 101 F.; pulse rate, 100, weak and thready; vomiting, severe; abdominal distention, uniform and extreme; diagnosis, complete intestinal obstruction." He performed an emergency cecostomy and introduced a Paul-Mixter tube. Rectal irrigations and irrigations through the cecostomy opening relieved the obstruction, but they had to be continued daily to empty the colon. This treatment was carried out for a long period following the operation and caused considerable decompression of the abdomen, but the obstipation persisted. On Jan. 14, 1932, the abdomen was opened, and the whole colon, even the appendix, was found to be distended. The presacral inferior mesenteric nerves and the left lumbar ganglions were resected. Following the operation, mineral oil, cascara and irrigations were given as a daily routine treatment. Spontaneous bowel movements began on February 2. The abdominal distention is no longer present, the patient has one or two normal stools a day without any medication, his general health is excellent and his whole outlook on life has improved.

CASE 2.—Theodore S., 4½ years of age, was admitted to the babies' wards of the New York Post-Graduate Medical School and Hospital on Aug. 20, 1932, with a history of constipation during infancy, which required the frequent administration of cathartics. After the first year of life normal evacuation rarely occurred, and cathartics and enemas were always necessary to empty the colon. Abdominal distention and colonic dilatation gradually became more marked. Loss of appetite, abdominal discomfort, slight fever and occasional vomiting would occur if laxatives and enemas were neglected. A roentgenogram taken on September 14, showed marked dilatation of the whole colon. Preliminary treatment aimed at the decompression of the abdomen was given for several weeks before the operation. The distention was reduced considerably, but in spite of treatment with mineral oil, cascara and colonic irrigations the obstipation persisted. On September 16 the presacral inferior mesenteric nerves were resected. Convalescence was satisfactory. A stool was passed spontaneously on the ninth day following the operation, since which time one or two bowel movements a day have occurred. There has been marked improvement in the general health of the boy, but the abdomen, while greatly improved, is still larger than normal.

CASE 3.—William D., 4⅝ years of age, was admitted to the babies' wards of the New York Post-Graduate Medical School and Hospital on Sept. 21, 1932, with a history of constipation since birth. He had had few natural bowel movements during his life and would go for days without passing a stool, unless laxatives or enemas were given. Of late the obstipation became much more troublesome. In St. Mary's Hospital, of Passaic, N. J., where the patient was under treatment for three months last spring, a diagnosis of megacolon was made. Examination at the New York Post-Graduate Medical School and Hospital showed slight abdominal distention, but it was not marked. A roentgenogram taken on October 16, showed dilatation of the rectum and of the sigmoid flexure. The case was considered as a mild form of Hirschsprung's disease. On October 18, a laparotomy was performed, and the presacral inferior mesenteric nerves and the left lumbar ganglions were resected. On the third day after the operation there were three spontaneous bowel evacuations, since which time the bowels have continued to act

naturally. With the exception of an infection of the upper respiratory tract, convalescence has been most satisfactory.

Comment.—There are many theories as to the cause of Hirschsprung's disease, but these will not be discussed here. There is definite neuromuscular imbalance and dysfunction, and the colon seems incapable of emptying itself of the large fecal accumulations. Section of the lumbar sympathetic nerves causes a break in the hyperactive inhibitory control. The relative safety of the operation and the highly gratifying results obtained by a number of surgeons make this procedure the method of choice in the treatment of properly selected cases of idiopathic dilatation of the colon.

CONGENITAL ATRESIA OF THE BILE DUCTS. DR. F. ELMER JOHNSON and DR. EDWARD J. JOHNSON.

A baby born on July 17, 1932, was admitted to St. Luke's Hospital on Oct. 4, 1932, because of a yellow color of the skin and eyes. The jaundice had been apparent since the second week after birth and had grown steadily more intense. For one month the baby had vomited everything swallowed. The stools had been white. The baby had gained but 1 pound (453.6 Gm.) in weight since birth.

On examination, the skin and sclera were found to be intensely jaundiced. There was marked craniotabes. The liver could be felt 3 cm. below the costal margin; the edge was hard. The spleen was easily palpable. There was bilateral clubfoot. The bile index was 83. The van den Bergh test gave a direct immediate reaction. There was no bile in the stools. There was mild secondary anemia. A diagnosis of congenital atresia of the bile ducts was made.

Operation.—The child was operated on by Dr. E. J. Donovan on October 21. A very large gallbladder was found lying in a deep fissure of the liver in such a position that the lower half was completely covered by the edges of the fissure. With a finger in the foramen of Winslow, the duct system was carefully examined. There was nothing that could be seen or felt where the common bile duct should be. The cystic duct was quite large, coming down to a point about 1 cm. above the upper part of the duodenum, then curving directly upward to enter the common hepatic duct directly. A cholecystogastrostomy was done by suture, and the incision was closed in the usual way.

Recovery.—Convalescence was uneventful, and a stool on the third day after operation showed bile. The jaundice disappeared rapidly and the bile index was lowered to 20 one week after the operation and to 15 one week later. The child has gained weight consistently, looks well and is at present entirely free from jaundice.

RENAL RICKETS. DR. GEORGE B. BAKER.

Two cases of renal rickets occurring in brothers, aged 9 and 6 respectively, are presented from the pediatric service of St. Vincent's Hospital. Roentgenograms and lantern slides show decalcification in the long bones and changes in the epiphyses resembling those observed in rickets. Studies of the blood revealed an elevation of the phosphorus content, a diminution of the calcium content, azotemia and a low content of carbon dioxide. The urinary findings were typical of those associated with so-called chronic interstitial nephritis. The older of the brothers died. Autopsy revealed chronic interstitial nephritis and a slight hypertrophy of the heart.

RELATION OF MEASLES AND TUBERCULOSIS IN YOUNG CHILDREN. DR. JEROME L. KOHN and DR. HENRY KOIRANSKY.

This article was published in the AMERICAN JOURNAL OF DISEASES OF CHILDREN, December, 1932, p. 1187.

PHILADELPHIA PEDIATRIC SOCIETY

Stated Meeting, Feb. 14, 1933

JOSEPH STOKES, M.D., *President, in the Chair*

WILMS' TUMOR. Presented by DR. HENRY SANGREE.

An irregular septic temperature and secondary anemia developed in a girl, aged 5, who had a markedly large abdomen and frequency of urination. A tumor of the kidney was found. It was irregular in outline and somewhat nodular and was chiefly on the right side. Chromo-ureteroscopy showed that the kidneys were functionally sufficient, but a bilateral pyelogram revealed that both ureter and kidneys were displaced to the left. Roentgenograms taken after a barium enema was given showed that the entire colon was also pushed to the left side by the tumor; the colon folded on itself. A complete study was made, and a number of transfusions of blood were given, but without success. At operation a huge tumor was found displacing all the lower organs to the left side of the abdomen; the peritoneum was densely adherent to the mass on all sides. It was difficult to establish a line of cleavage. After the tumor was enucleated the child suffered from surgical shock, and, although a transfusion of blood was given immediately, she died soon afterward. Pathologic examination showed that the growth was radiosensitive and was a grade embryonal Wilms tumor.

Some tumors present a good surgical risk if they are not too closely adherent to the peritoneum and can be easily shelled out. It is impossible, however, to know before the operation the extent of the adhesions. Roentgen therapy as a preliminary procedure is considered effective in reducing the size of the tumor and in lowering the mortality.

DISCUSSION

DR. EDWARD B. HODGE: Tumors of this type are extremely interesting to the surgeon as well as to the pediatrician and the pathologist. This patient was first brought to the outpatient department of the hospital. Immediate operation was advised, but the parents refused to follow this counsel. Not until six months later was the child admitted to the hospital. These six months made a great deal of difference to the patient. I believe that when such a tumor is found and when there is a sound kidney on one side an operation should be performed in practically all cases. Dr. Sangree gave some contraindications—cachexia and weakness. Often the patient is thought to be weaker than he is. With present-day technic, transfusions and other methods are available to bolster up the patient's strength if necessary. Cases of this nature are hopeless unless an operation is performed, and I believe that the surgeon should risk a possible increase of his mortality statistics on the chance of saving a patient. The case presented was a particularly unfavorable one. The success of the operation depends not only on the size of the tumor, but also on the adhesions, and one cannot know what the condition is before an incision has been made. Some large tumors, even the extremely large ones, shell out easily. In the case presented the whole peritoneum had to be dissected; this was a contributory factor to the fatal outcome. The incision required in an operation of this kind is an anterior one; there is not room for a posterior incision. The displacement is so great that the intestines are forced to one side. A right anterior incision which allows sufficient space is the best one for the procedure. After the kidney has been exposed and after the line of cleavage has been obtained, it is not difficult to expose the renal vessels and to remove the tumor, that is, if the adhesions are not great. If the adhesions are extensive, the operation is difficult.

DR. JOHN P. SCOTT: Tumors of this type are often congenital. They have been known to be so large as to cause considerable embarrassment during delivery. Similar tumors are found frequently in young pigs, but they are not found in cows

or in sheep. Apparently pigs and human beings are most frequently affected by this type of growth. The feature of interest in this case is the extreme left position of all the abdominal organs. If high voltage roentgen therapy had been administered early, it might have caused the tumor to shrink and would thus have made possible a much more satisfactory surgical removal. I was ignorant of this method of treatment at the time I saw the patient, and I had read articles affirming that treatment by irradiation was entirely ineffective.

DR. HENRY SANGREE: Most tumors of this type are congenital. There is metastasis as soon as the enlargement is palpable.

INFLUENZAL MENINGITIS AND ITS TREATMENT WITH SERUM. Presented by DR. ERNEST NOONE.

Two cases of influenzal meningitis were presented: the first in a boy 6 years of age, who completely recovered, and the second in a boy 7 years of age, who died at the end of twelve days, but whose brain was found to be almost entirely clear of exudate at autopsy. Both patients were treated with serum. The first patient was treated with serum made by the injection of cultures of "smooth" bacilli (Pfeiffer's bacillus) into a horse, by Dr. Dorothy Weiss, for Parke, Davis & Co. A total of 333 cc. of the serum was injected into the patient by cisternal and lumbar routes over a period of thirty-four days. Daily drainage was done, and two transfusions of the father's blood were given. Bacilli were demonstrated on a smear and on a culture; they returned twice to the spinal fluid before ultimate recovery. The patient had severe reactions to the serum. The temperature was 106 F. and above on three occasions.

The second patient was treated with a small amount of the serum obtained from Parke, Davis & Company and a larger amount of a serum prepared by Dr. Margaret Pittman of the Rockefeller Institute. In the second serum eighteen different type *B* strains of influenzal meningitis were used in the process of immunization at the time the horse was bled. This patient also had marked reactions to the serum. The clinical condition appeared to improve throughout the course of the disease. When the brain was exposed at autopsy, the thick shaggy exudate usually found was absent. The brain was only slightly congested; there were a few small areas of very thin exudate and a small area of firm exudate just over the cerebellum, about the roof of the fourth ventricle. Scarcely any evidence of meningitis was found in the major part of the brain. There was a block of the aqueduct of Sylvius. Apparently the serum had been an efficient form of treatment. It is possible that death was due to serum shock rather than to meningitis.

DISCUSSION

DR. JOHN W. HOLMES: In view of the terrific mortality in influenzal meningitis, almost 100 per cent, Dr. Noone deserves a great deal of credit for having brought about the recovery of the one boy and a practical clearing up pathologically of the condition in the other one. It seems reasonable that the serums used were bactericidal for the strains with which these children were infected. From a clinical standpoint it is almost impossible to distinguish influenzal meningitis from any other form of meningitis caused by the pneumococcus, the streptococcus or any pyogenic organism. The onset is distinctly characteristic, with high fever, rigidity of the neck and motor irritability. The course is rapidly progressive. The only way to make a differential diagnosis is by tapping the spinal fluid and isolating the causative organism.

There are two outstanding characteristics in influenzal meningitis: first, the enormous number of bacilli found constantly in the spinal fluid, in which, as Dr. Kolmer and others have pointed out, a complement is totally lacking. Another interesting characteristic, as Dr. Noone has stated, is the fairly early block in the spinal channels. It seems to me that it is necessary not only to obtain a specific serum but also to devise some efficient method for its thorough distribution in the

cerebrospinal channels. Closer cooperation between the clinician and the laboratorian, is essential for further progress.

Rivers has shown that influenzal meningitis is primarily a disease of infancy. Seventy-nine per cent of the cases studied by him occurred in children under 2 years of age. In the 220 cases reviewed by him there was a mortality of 92 per cent. Of the 17 patients who recovered, only 5 were under 2 years of age; 3 of these did not make a complete recovery but suffered from disabilities, such as blindness, deafness or paralysis. Dr. Bloom, in a survey made as late as 1931, reported 302 cases, with a mortality of 92 per cent and recovery in 24 cases. The 17 recoveries reported by Rivers are included in these 24 cases, leaving only 7 additional recoveries during a period of ten years. Of these 7 cases, only 1 was in a child under 2 years of age.

ACHALASIA OF THE CARDIA (SO-CALLED CARDIOSPASM). Presented by DR. JAMES REILLY.

A case of cardiospasm was accompanied by a pulmonary disorder in the form of parenchymal infiltration due to the insufflation of material spilled over from the dilatated esophagus.

DISCUSSION

DR. RALPH M. TYSON: It has been my impression that anatomically there are no sphincter muscles at the lower end of the esophagus. Dr. Jackson has shown by means of the esophagoscope that this is true physiologically. I wonder whether Dr. Reilly has anything to say regarding this point.

DR. GABRIEL TUCKER: I have nothing to add to Dr. Reilly's excellent paper. It was my privilege to examine on several occasions the interesting case which he reports. I believe, as he does, that the pulmonary lesion is probably secondary to the esophageal lesion. The fact that the pulmonary symptoms were much more prominent than the esophageal symptoms would lead one to believe that preventriculosis, or so-called cardiospasm, occurs more frequently in children than is suspected. Dr. Ralph Tyson reported a case of preventriculosis in an infant, and I have recently seen, with Dr. Ajack and Dr. Bertin, a similar case in a child 4 days old at the Misericordia Hospital.

One of the most valuable recent contributions to the literature on the subject of so-called cardiospasm is the Semon lecture for 1929 by Dr. Harris P. Mosher, entitled "The Lower End of the Esophagus at Birth and in the Adult." I believe that it is the consensus that the constriction is at the level of the hiatus oesophageus and that it is due to extrinsic conditions rather than to the musculature of the esophagus or of the cardiac end of the stomach. The diagnosis in preventriculosis is made by inspection of the interior of the esophagus by esophagoscopy. In most instances this inspection confirms the roentgen diagnosis. The treatment for the condition consists in dilation of the hiatus oesophageus by means of the passage of an esophagoscope, or by hydrostatic or aerostatic dilation. All methods of dilation of the hiatus oesophageus should be preceded by direct inspection by means of the esophagoscope. Treatment should include the consideration of abdominal conditions, including that of the appendix, gallbladder and other organs, which may give rise by reflex influence to the condition. Occasionally a patient is seen in whom one dilation of the hiatus oesophageus by the passing of an esophagoscope results in a complete cure. More frequently, however, repeated dilations by means suitable to the individual case, in addition to general medical care, are required.

DR. MAURICE MCPHEDRAN: I did not observe the fluid level in the esophagus in May, 1930, or in January, 1931; the x-ray films were considered as showing normal findings. I am interested solely in pulmonary lesions, and I overlooked the other condition. When the patient returned in June, 1932, with extensive pulmonary damage, I glanced at the wet flat film and thought that the pulmonary lesion probably accounted for the cough which brought the boy to the clinic.

The fluid level in the esophagus was discovered only when the films were examined stereoscopically; it was best seen in the stereoscope rotation exposures. I had already sent the boy to the Children's Hospital, with a diagnosis of probable tuberculosis. I corrected the diagnosis and transferred the case to Dr. Reilly. The outcome has been happy for all.

In addition to the films that Dr. Reilly showed, another set was made in February, 1933, which showed much more extensive clearing. As is indicated, the pulmonary lesions did not have the characteristic features of tuberculosis. The spots were larger and denser, and there was no excavation, despite the large confluent patches. However, in changing my diagnosis before the case was transferred to Dr. Reilly, much help was derived from the observation of the fluid level in the esophagus.

DR. JAMES REILLY: Another method of attacking this condition is Rammstedt's operation on the pylorus, which is often performed. There is definite musculature at that point.

Stated Meeting, March 14, 1933

JOSEPH STOKES, M.D., *President, in the Chair*

ERYTHROBLASTOSIS NEONATORUM. Presented by DR. THEODORE WILDER.

The literature regarding a group of conditions affecting the new-born, characterized by severe anemia of unknown cause with erythroblastosis, was summarized by Diamond, Blackfan and Baty in the *Journal of Pediatrics* (**1**:269 [Sept.] 1932). In order to emphasize the frequency of the syndrome, two cases are reported here, and mention is made of four other probable cases not included because of insufficient data.

The maternal history in the first case contained no abnormal features. The infant was born at term and weighed 10 pounds and 6½ ounces (4,720.2 Gm.). On the eighth day she became jaundiced and pale. On the ninth day the red blood cell count was 2,100,000; on the tenth day, it was 1,200,000, and the baby was given a transfusion of 100 cc. of the father's blood. Three days later, the red cell count had risen to 3,300,000, and the nucleated red cells, which were previously 61,000 per cubic millimeter of blood, had dropped nearly to normal. A second transfusion of 70 cc. of blood was given the next day. For the ensuing two weeks the red cell count remained under 3,000,000, after which improvement was uneventful, and the liver and spleen, which had been enlarged gradually diminished in size. The rise in the red cell count had so far exceeded expectations that it was felt that the first transfusion had accomplished more than a mere replacement of destroyed red cells; it appeared to halt the underlying process which was causing the anemia. Laboratory data were not unusual except that the platelets were 600,000 on the tenth day, and later on two occasions were normal. Both parents likewise gave normal values for the fragility, Wassermann and van den Bergh tests, the icteric index and the usual tests of the blood.

In the second case, which was more severe clinically, the patient did not survive. The maternal history was unimportant except for severe bleeding preceding an abortion and, during adolescence, a severe hemorrhage following tonsillectomy. There was one living normal child. The patient became severely jaundiced five hours after birth, and both the liver and the spleen were palpated below the level of the umbilicus. The red blood cell count was 1,500,000, with 95,000 nucleated red cells. Death occurred forty-four hours after birth. At autopsy the salient observations included a sterile blood culture, patency of the bile ducts and enlarged and hemorrhagic lymph nodes around the hilus; the liver, spleen and bone marrow were hemorrhagic and very dark red. Microscopically, practically all the organs, particularly the liver, spleen and bone marrow, showed intense erythropoiesis.

Of the four other fatal cases mentioned, three appeared to belong to the group termed icterus gravis neonatorum; autopsy, permission for which was obtained in one case, revealed, however, a typical erythroblastic liver and spleen. The patient in the fourth case showed marked pallor with a little jaundice and had a red cell count of 1,050,000 on the tenth day. Death occurred on the eleventh day. The liver and spleen were enlarged, but the nucleated red cells numbered only 1,750 per cubic millimeter of blood. Permission for autopsy was not obtained.

THE MONOCYTE-LYMPHOCYTE RATIO IN TUBERCULOUS CHILDREN AND ITS RELATION TO THE COURSE OF THE DISEASE. DR. MARY JANE WALTERS and DR. ARTHUR D. WALTZ.

The blood pictures of five tuberculous children studied for from eight to fifteen months in Dr. McPhedran's service at the Children's Hospital were found, on analysis, to parallel fairly closely the clinical course, roentgenologic findings and sedimentation tests.

Supravital studies revealed occasional very slightly modified monocytes in the severest cases, but never any epitheloid cells. The monocyte count and the monocyte-lymphocyte ratio were considerably, but fairly constantly higher with the supravital method than with the routine dry method, Wright's stain being used. The discrepancy was felt to be due to differences in technic, rather than to differences in the identification of cells.

In general, the total number of monocytes and the monocyte-lymphocyte ratio were proportional to the severity of the disease, though in the two most severe cases there was great irregularity in these values, apparently corresponding to alternate healing and spreading as borne out by roentgen examination and, in one case, by autopsy.

From this limited number of cases it would appear that the monocyte-lymphocyte ratio is a good "short-cut" index of the state of the disease, but that the whole blood picture is of much greater value, especially in judging the possible formation of abscesses and exhaustion of the bone marrow.

DISCUSSION

DR. M. J. WALTERS: I think that Wright's stain does give a good indication. In fact, though I mentioned both Wright's stain and the supravital stains at the beginning of the discussion of the charts, I later disregarded the supravital curves and assumed that we were considering Wright's curves only, because though there was considerable difference between the counts by the two methods, the difference was fairly constant. I believe that the discrepancy was probably due to differences in technic, not to differences in classifying the cells. Sabin believes that monocytes can be more readily distinguished by the supravital technic. I do not feel so, but I do think that the supravital studies are valuable in a qualitative way, for instance, in judging whether the cells are vigorous or degenerating and whether they are modified toward the epitheloid type.

The monocyte-lymphocyte ratio is like many other so-called indexes in that its indications are often infallible only when the condition is so severe that no test is need. The monocyte-lymphocyte ratio is an additional test to round out the picture, but it is not prognostic from day to day. After a long series of counts has been analyzed, one may be able to judge what is likely to happen, but one certainly cannot do this from a few counts.

LEUKEMIA IN INFANTS AND CHILDREN. Presented by DR. JAMES M. BATY, Boston.

Leukemia in infants and children differs from the disease as it occurs in adults chiefly in that it is practically always acute or subacute. Chronic leukemia, the more common form occurring in adults, is extremely rare before puberty and

has not been recorded during the first five years of life. There are certain differences in the clinical syndromes, but the hematologic and pathologic changes are essentially similar.

The disease may occur at any age, but there is a greater incidence during the first than during the second five years of life. The symptoms began during the first year in four cases in this series, at the age of 4 months in one instance.

The onset is usually insidious, with the appearance of pallor, weakness and lessened activity. Physical examination shows marked pallor of the skin and mucous membranes, dyspnea, purpura and enlargement of the spleen, liver and lymph nodes. The blood shows anemia of varying degree. The platelets are constantly reduced, numbering 75,000 or below as a rule. The leukocyte counts varied from 2,000 to 1,000,000 in this series. The differential counts vary, the most important finding being large numbers of undifferentiated "blast" forms (from 25 to 95 per cent). Roentgenograms of the skeleton often show evidence of varying degrees of erosion of the bone. This may be in the form of localized areas of diminished density or of a more general osteoporosis.

Another change of interest has been noted recently by Dr. E. C. Vogt in films of the long bones. In some cases there is an transverse zone of diminished density from 2 to 5 mm. in width just proximal to the metaphyses. This zone is most marked in bones in which growth is occurring rapidly. It becomes relatively more prominent as the disease progresses, and was noted to be more common in the younger children.

Infection presents the greatest difficulties in diagnosis. There may be high leukocyte counts with many immature forms, particularly in pneumonia, peritonitis and streptococcic septicemia. Although immature cells are present, there are relatively few very young, undifferentiated "blast" forms. Infection may produce leukopenia with leukocyte counts as low as a few hundred per cubic millimeter. In such instances the immature forms are relatively more numerous, and for this reasons the differential diagnosis presents greater difficulties. This is even more true when there is coincident suppression of the other elements of the bone marrow. In the presence of anemia, thrombopenia and leukopenia, differentiation between leukemia and infection is at times practically impossible.

The duration of the disease in the forty cases in this series varied from two weeks to sixteen months, the average being three and nine-tenths months.

DISCUSSION

DR. J. P. SCOTT: Has Dr. Baty any idea what proportion of the cases have been in the form of aleukemia? I have seen a number of cases, three in the past year, in all of which the patients died and all of which showed leukocyte counts between 2,000 and 3,000. Are aleukemic forms more frequent in children than those showing higher counts?

DR. R. M. TYSON: Has Dr. Baty anything new to offer in regard to the etiology?

DR. E. J. MORRIS: Dr. Baty mentioned that it is impossible, or almost impossible, to differentiate the myeloblast and the lymphoblast with Wright's stain. They have no granules, so oxydase staining would not help. I should like to find out how they are differentiated.

DR. J. M. BATY: In regard to the differentiation of myeloblasts and lymphoblasts, my associates and I used Wright's stain, supravital stains and oxydase stains, but, as Dr. Morris pointed out, we did not get much help from these methods. We differentiate the "blast" forms, as Dr. Minot has said, "by the company they keep." If in a smear from a patient with leukemia we find that the cells are young neutrophils, the cells in question are classified as myeloblasts. On the others hand, if numerous lymphocytes are present, they are called lymphoblasts.

The question of ruling out leukemia on the basis of a normal platelet count, obviously one laboratory procedure, is not important. However, we have never

seen a case of leukemia that did not show a diminution of platelets when observed over a considerable time. The platelets may be normal during a remission. In chronic leukemia, also, the platelets may be normal. There are only five cases of chronic leukemia that I know about: two that came under our observation, two in the literature and one in Philadelphia. The platelet count is apt to be not only normal, but above normal, until the terminal stages.

The question of etiology, I cannot answer. There are various theories. We feel that the condition belongs to the group of neoplastic diseases, although there is some evidence that the more acute cases are secondary to infection.

Considering the proportion of aleukemic cases, we have seen about fifty patients with leukemia; in approximately 50 per cent the diagnosis was aleukemic leukemia, according to the way we classify the disease. Dr. Minot would not agree on some of the cases that we include in this group, especially the one with 20,000 leukocytes. He feels that the patient should be aleukemic throughout the course of the disease. We feel that if the counts are low through the greater portion of the disease it is of the aleukemic type. The members may be interested in knowing, also, that in about 50 per cent of our cases the condition was myeloblastic, and in about 50 per cent, lymphoblastic, although until a few years ago myeloblastic leukemia was said not to occur in infants and children.

ANEMIA OF PREMATURITY. DR. LOUIS K. DIAMOND.

Premature infants show a fall in the levels of erythrocytes and hemoglobin which begins at the first week of postnatal life and reaches its greatest severity in all infants by about the twelfth week. This is in contrast to the changes in the blood in full term infants, in whom a rapid fall occurs from the polycythemia present at birth, and in whom there is relatively little change after the second or third week. In the premature infant a gradual increase in red blood cells and hemoglobin begins spontaneously in the fourth month of postnatal life, and progresses during the following three or four months until practically normal levels are reached. This report is based on weekly blood counts made on seventy-five prematurely born but otherwise healthy babies. It seems evident from the slides shown that the degree of anemia which develops is directly proportional to the degree of prematurity, which was judged from the length of the infant on admission.

Various theories have been advanced to explain the anemia of prematurity, among which are: (1) insufficient storage of iron due to the birth before term (this can be refuted by the fact that the anemia which develops is not hypochromic as that of true iron deficiency usually is; further, the administration of iron in the usual forms will not prevent the occurrence of anemia, and examination of the organs at necropsy shows no relative deficiency in iron); (2) inability to utilize iron for blood-building purposes, and (3) inability of the production of blood to keep up with the rapid gain in body weight and the changes in the blood volume, and therefore a functional insufficiency of the hematopoietic system.

In treatment, there is little to be done in preventing the development of the anemia during the first ten or twelve weeks of postnatal life. The administration of iron, liver extract with iron or egg yolk will hasten the return to normal levels of erythrocytes and hemoglobin after the twelfth week when a spontaneous improvement has begun. I am inclined to use only iron and ammonium citrate in doses of from 1 to 2 Gm. a day.

DISCUSSION

DR. M. J. WALTERS: Has Dr. Diamond any theories that the anemia of prematurity possibly develops because the digestive tract, probably on account of its immaturity, is not able to absorb some factor that would help in the use of the iron that is already stored in the body—the same general condition as in pernicious anemia, namely, some fault in absorption of the gastric mucosa?

DR. E. J. MORRIS: Did Dr. Diamond make small repeated injections of blood into the muscle? That is, was the blood of the parents repeatedly injected into the muscle in the early weeks before iron would be of value?

DR. J. D. DONNELLY: Has Dr. Diamond noticed any parallelism between jaundice in the new-born and the degree of anemia at the time or later?

DR. S. X. RADBILL: What is the status of copper in these anemias? I do not remember hearing Dr. Diamond mention copper.

DR. L. K. DIAMOND: In regard to Dr. Walter's question concerning etiology, my associates and I are directing our present attempts in the investigation of the etiology of the anemia of prematurity toward the determination of the possible absence of an intrinsic factor, such as Dr. Castle has described in pernicious anemia, and also in studies of the iron metabolism of premature infants. So far as we can tell, there seems to be no abnormality in the digesting or absorption of material from the gastro-intestinal tract. Premature infants are said to show a negative iron balance, but this is still controversial.

As to the injection of blood, we have not used the intramuscular route. We gave a large number of premature infants repeated transfusions of matched whole blood, not because of the anemia, but because of other symptoms of disturbance, such as failure to stabilize the body temperature, vomiting and diarrhea. This procedure prevented the appearance of severe anemia. Neither intramuscular injections of blood nor the giving of hemoglobin has been used extensively, to our knowledge.

There was no evident relation of anemia to the occurrence of icterus in these infants. Inquiry and investigation of the records have shown no evidence of jaundice other than the mild common icterus neonatorum. Moreover, there has been no other evidence of the destruction of blood, such as an increased excretion of urobilin in the urine and stools.

As to the use of copper in the treatment, we have attempted the addition of copper to iron in a small number of cases with negative results. In the hypochromic anemias, the addition of copper, as shown by Dr. Josephs of Baltimore, has resulted in more rapid improvement. But the anemia of prematurity is not primarily hypochromic.

Book Reviews

Ueber die maligne, sogenannte toxische Diphtherie. By Doz. Dr. Adolf Hottinger. Price, 6 marks. Pp. 88. Berlin: S. Karger, 1932.

The epidemiology of diphtheria during the past decade is discussed, and special reference is made to the increase of this disease in England, Austria, Hungary and Germany. In the latter country, the greater incidence has been proportionate to the increase in density of the population.

No marked increase in mortality has been apparent in the countries as a whole, but in the large cities and certain sections, a higher death rate from diphtheria is pronounced owing to the malignant, toxic or septic types. In this connection, Düsseldorf, with a population of 450,000, is cited. In Düsseldorf, in 1921, there were 391 cases of diphtheria, with 22 deaths. The comment is made that since 1930 the death rate seems to have been increasing, especially in the hospitals for contagious diseases, where in the year named the rate was 52 per cent for toxic diphtheria. However, when the cases in which the patients died within twenty-four hours after admission to the hospital were deducted, the rate was 32 per cent.

Another observation is that laryngeal cases are much less frequent, while toxic cases are becoming more numerous. A similar situation has been encountered in Chicago during the past few years.

Most of Hottinger's cases occurred between the third and thirteenth year of life. More boys than girls were affected, but fatal outcomes were more frequent in the latter. The opinion is expressed that toxic diphtheria is about twice as contagious as the ordinary type. The rôle of the school in the spread of diphtheria is also discussed.

Although severe cases of the toxic type sometimes developed within twenty-four hours, nevertheless, in spite of early treatment with large doses of antitoxin, death often ensued about the twelfth day. Another interesting fact related by the author is that the toxic cases occurred mostly among the better classes, and especially in the outlying districts of the city. Here, the reviewer may interject the remark that a similar occurrence is not unusual in respect to any contagious disease.

The symptoms consist of severe edema and sometimes hemorrhages in the mucosa, seropurulent sanguineous secretions from the nares and a characteristic fetid odor. Periglandular edema often occurs within a few hours and causes disfigurement of the face and the neck; in this country this variety of the disease is alluded to as the "bull neck" type. Petechiae and larger bleedings may be seen in the region of the shoulder girdle. There may be weakness of the peripheral circulation, paleness of the skin and the face, a soft irregular pulse and a lowered blood pressure. Vomiting is often severe. The liver is nearly always enlarged; the kidneys are likewise affected, with albumin in the urine, and nephritis is common.

The importance of the clinical picture in diagnosis is emphasized, and bacteriologic examination is considered second in importance. The first smears from the throat in toxic diphtheria are often negative.

It is further pointed out that the death rate for cases of toxic diphtheria with mixed infection, such as streptococcic, was no higher than that for cases without mixed infection. Nor did spirochetes influence the death rate for cases of toxic diphtheria. These facts are interesting, because for many years, when the death rate from diphtheria was high, physicians of limited experience almost invariably expressed the opinion that the higher rate must be due, not to diphtheria alone, but to secondary invaders, especially the streptococci.

As an indication of the excessive rates of fatality, the following tabulation is presented, showing the several groups according to the day of the disease on which the patients entered the hospital.

Patients	Day of Entrance	Mortality Percentage
28	First	25
37	Second	40
25	Third	48
32	Fourth to sixth	53

The patients who recovered stayed in the hospital from ten to twelve weeks. Most of the patients who died did so within from ten to fourteen days after the onset, but some lived as long as from forty to fifty days. Eighteen of 34 patients who received treatment on the first day of the disease died. In another group of 178 cases, the mortality was 43 per cent. Such figures are astounding, and demonstrate clearly that diphtheria may still be a disease with dire consequences.

Mention is made of pulmonary diphtheria in some of the cases. In these, the findings on percussion and auscultation were no different from those in "real pneumonia."

In nearly all the cases there was enlargement of the liver. Damage to the kidneys was also common. A reduction in the size of the liver after enlargement was considered a favorable prognostic sign. More important was damage to the myocardium, which was the most serious and hopeless complication.

Serum sickness occurred in 47 per cent of the cases, but this figure would have reached 68 per cent if the patients who died before serum sickness could occur had been included. Paralysis due to the injection of serum was not seen.

The author concludes that the curative value of antitoxin in malignant cases is poor. From 1928 to 1929, he gave large doses of from 80,000 to 140,000 units of antitoxin. Occasionally he gave from 15,000 to 20,000 units intravenously on the first day, and repeated this dose once or twice. Sometimes 80,000 units was given on the first day. Notwithstanding this large dosage, the mortality was high. The following figures illustrate some of the results: In the 49 cases in which from 10,000 to 30,000 units was given, the mortality was 33 per cent; in 51 cases, from 40,000 to 50,000 units, mortality, 40 per cent; in 30 cases, from 60,000 to 140,000 units, mortality, 50 per cent.

As a result of observations on the preceding groups, in which the mortality was higher with the increased dosage, the following modifications of treatment were adopted:

1. From 5,000 to 30,000 units was given in one or two doses intravenously and intramuscularly. The results were poor; 14 of 32 patients died (44 per cent).

2. In this group, the serum was given intravenously, intramuscularly and intraspinally. Six of 14 patients died (43 per cent).

3. Large doses, up to 140,000 units, were given in from three to six injections, intravenously and intramuscularly. The results were not good; 22 of 52 patients died (42 per cent).

4. This group was treated with from 20 to 100 cc. of antistreptococcic serum and from 20,000 to 50,000 units of diphtheria antitoxin, intravenously and intramuscularly. Eleven of 17 patients died (65 per cent).

5. In 7 severe cases, serum prepared against mixed cultures of the diphtheria bacillus and of streptococci, and showing a high titer of diphtheria toxin was used. At first from 40,000 to 80,000 units of this serum was given alone, but the results were no better than those obtained with simple serum. There were 4 deaths (60 per cent). The serum prepared against mixed cultures of the diphtheria bacillus and streptococci was also used in 65 cases with additional forms of treatment, but proved to be no better than ordinary diphtheria antitoxin.

The author denies streptococcic activity in toxic diphtheria from a clinical and a theoretical point of view. No streptococci were found in blood cultures in even

the most toxic cases. In only 50 per cent of the cases were streptococci found in smears, and in the patients who died there was mostly an absence of streptococci.

6. Eleven patients were treated with diphtheria convalescent serum in doses of 20, 50 and 120 cc., besides from 50,000 to 70,000 units of horse serum. The results were not promising, since 5 patients died (45 per cent). There was no decrease in the complications.

7. In this group, the patients were given arsphenamine and diphtheria antitoxin. On the first day 0.15 Gm. of neoarsphenamine was given intravenously, and on the second and third days, from 0.15 to 0.2 Gm., so that in three days from 0.45 to 0.5 Gm. was given. The results were not satisfactory. Eight of 24 patients died (33 per cent), but in this group there were patients who lived at least several days after admission.

8. On admission the patients were given 10,000 units of concentrated diphtheria serum intramuscularly and 4,000 units of the serum prepared against mixed cultures of the diphtheria bacillus and streptococci intravenously as well as intramuscularly. The small doses of the latter serum were repeated from one to three times, according to the condition of the patient, in the first three to six days. None of this series of 15 patients died. However, this may have been due to the milder cases. On account of this result, Hottinger began to think that the value of the serum was not only as a specific antitoxin, but also as a nonspecific serum. Therefore, he treated 30 patients with diphtheria with normal horse serum without antitoxin, and 2 patients with toxic diphtheria with the same serum. All reacted well. The 2 patients with toxic diphtheria recovered in the same time as did other patients with toxic diphtheria.

Hottinger's experience and conclusions are practically identical with those reached in the hospitals for contagious diseases in Chicago during the past twenty years or more. As pointed out, myocarditis is the complication most to be dreaded in the toxic type of diphtheria. Abdominal pain and vomiting are frequently the danger signals that indicate the development of this condition and forecast a fatal termination.

As clearly shown by the author, huge doses of diphtheria antitoxin are of no avail in certain types of malignant diphtheria. Nevertheless, it seems that the use of dextrose intravenously is of more value than Hottinger attributes to it, and it might have been well had he stressed the necessity for absolute rest in bed, the patients not being permitted even to raise the head from the pillow.

In conclusion, we should be willing to believe from Hottinger's experience, as well as from our own, that a high death rate from toxic diphtheria is attributable to some extreme virulence of the diphtheria organism, and not to secondary invaders or to the use of standard diphtheria antitoxin which is potent for the average type of diphtheria.

Holt's Diseases of Infancy and Childhood. By L. Emmett Holt, Jr., M.D., and Rustin McIntosh, M.D. Tenth edition. Price, $10. Pp. 1,190, with 205 illustrations. New York: D. Appleton & Company, 1933.

In the preface to the tenth edition of this well known textbook, the authors state that their aim has been to incorporate the newer facts and points of view in pediatrics without sacrificing the clear and concise style which has characterized the book in the past. In this purpose they have succeeded admirably. The entire revision has been thoroughly brought up to date, and every subject is presented directly and to the point. The illustrations are distinct and well chosen. The bibliography listed at the end of each chapter is a valuable addition to this revision.

In the presentation of disease processes, the basic principles receive adequate emphasis. In reading this textbook the medical student who is beginning his study of pediatrics will not be confused by a mass of detail and wordy, tedious discussions. Considerations of therapy are rational and sound. No drug is advised unless there is a definite indication for its use.

Extensive changes have been made in the present edition. The sections on nutrition and nutritional disorders, deficiency diseases, diseases of the blood and diseases of allergy have been completely rewritten; the same is true of much of the material on diseases of the nose and throat, the genito-urinary system and the nervous system. The list of rewritten articles includes those on premature infants, diabetes mellitus and, among the infectious diseases, tuberculosis, rheumatic fever and the common cold. New articles have been added on chemical relations in childhood, immunology in childhood, general considerations of allergy, serum disease, burns, lead poisoning, dwarfism, diseases of the parathyroids, xanthomatosis, lipoid cell pneumonia, rabies, smallpox, postinfectious encephalitis, erysipelas, typhus fever, tick-bite fever, tularemia, undulant fever and some of the less frequent diseases of the skin and of the nervous system.

Acidosis and Alkalosis. By Stanley Graham, M.D., and Noah Morris, M.D. Price, $2.75. Pp. 203, with 27 tables and 23 figures. Baltimore: William Wood & Company, 1933.

This small volume consists of a general survey of the acid-base balance and the application of this knowledge to the treatment of diseases in infants and in children. The authors have at all times kept in mind the needs of those physicians who are not deeply versed in the intricacies of chemical physiology.

The first few chapters deal with the reaction of the blood, definition of terms, carbon dioxide dissociation curve, defenses against acidosis and alkalosis and the determination of the state of the acid-base equilibrium. This general discussion of the fundamental principles involved in acid-base balance is written in simple style so that it is easily understood by any physician, and it furnishes an excellent basis for the later presentation of disturbances in acid-base balance.

Conditions discussed from the clinical point of view include: diabetes, nephritis, gastro-enteritis, cyclic vomiting, ketosis, salicylate poisoning, acidosis due to anesthesia, tetany and pyloric stenosis. In all these diseases the chemical changes are clearly described, and the proper methods of treatment are suggested. Sufficient case histories are included to illustrate the application of diagnostic and therapeutic procedures and the evaluation of laboratory findings.

The authors have succeeded in presenting the complex subject of acidosis and alkalosis in as concise and as clear a manner as is possible. This book is recommended highly to the practicing physician who desires to improve his management of disturbances of the acid-base balance.

Les paralysies diphtériques. By Pierre Uhry. Pp. 124, with 6 illustrations, Paris: Librairie Louis Arnette, 1933.

The experimental studies of Dr. Pierre Uhry on diphtheritic paralyses are presented in this volume. Guinea-pigs, dogs and rabbits were used in the research. The behavior of these animals after injections of diphtheria toxin was carefully observed. The physiopathology and histopathology of the experimental paralysis as well as various methods of therapy were carefully studied. There were a few cases in which the pathologic changes of diphtheritic paralysis in man were available. An extensive bibliography is furnished. The author summarizes the results of his work in the following conclusions:

1. Diphtheria toxin is the sole cause of the paralysis.

2. The paralysis is due to toxic polyneuritis of the peripheral nerves in which degenerative changes are primary.

3. The toxin is fixed in the nerves.

4. The toxin acts on the nerve endings locally near the site of injection and also is absorbed in the blood stream, from where it is fixed by the nerve endings in distant parts.

5. Therapy is essentially preventive. In order to be effective, serum must be given early, so that the toxin is neutralized before it is fixed in the tissues. After the appearance of paralysis, serum has no curative effect.

A New Approach to Dietetic Therapy. By Eugene Földes. Price, $5. Pp. 380, with 15 charts. Boston: The Gorham Press, 1933.

Disturbances in water and mineral metabolism are considered to be important pathogenic factors in a large number of diseases. These disturbances are of two types, either a general retention of water and minerals or a mobilization with local accumulation of water and minerals previously retained throughout the body.

The contents of the book are arranged in three parts. Part 1 consists of a presentation of the physiologic and pathologic principles underlying water and mineral metabolism. In part 2 the author discusses those diseases in which retention or mobilization of water and minerals is considered of prime etiologic importance. Part 3 contains the therapeutic procedures, both dietary and medicinal. Many cases are reviewed to demonstrate the methods of treatment and the good results from therapy.

Pathologic retention of water and minerals is considered of fundamental importance in the following conditions: epilepsy, eclampsia of pregnancy and infancy, migraine, angina pectoris, allergic diseases, gout, essential hypertension, pernicious anemia, polycythemia, acne vulgaris, nervous and psychic disturbances, constitutional changes and aging. In most of these diseases the author claims excellent results from the use of measures devised to prevent abnormal retention of water and minerals in the tissues.

Enuresis or Bed Wetting. By Dr. R. J. Batty. Price, three shillings, 6 pence. Pp. 90, with 1 illustration. London: John Bale Sons & Danielsson, Ltd., 1933.

Batty presents an interesting and general discussion of enuresis. The subject matter is divided into four parts: history, anatomy, causes and methods of treatment. Lack of control of the bladder has been a source of worry to mothers throughout the ages, and the subject was celebrated by Hippocrates, Galen, Shakespeare, Rembrandt and every generation of medical writers to the present time.

Physiologically, the author stresses the trigonal muscle on the floor of the urethra which has a separate innervation and is under voluntary control.

Among the causes of enuresis the author stresses heredity, environment, single physical defects, especially of the tonsils and adenoids, thread worms and mental dulness.

There is a summary of the countless drugs and remedies which have been used in treatment. Batty stresses the value of anthelmintics, treatment of physical disorders and training. "Treatment by suggestion should be tried in all cases where simple treatment has not been successful."

The book is well written, and the material is presented in an unusually lucid and interesting manner. The physical and physiologic approach is excellent. The psychologic and psychiatric approach is almost entirely ignored. The chief value of the book is historical. As such it serves the purpose which the author intended: "There has been no previous monograph in English on this subject and this little book is an attempt to fill the gap."

Children, Young People and Unemployment: A Series of Enquiries into the Effects of Unemployment on Children and Young People. Part I. Price, 35 cents. Pp. 112. Geneva, Switzerland: Save the Children International Union.

While parliamentarians and economists of all schools have been endeavoring, with rather less success than more, to combat the world-wide ravages of unemployment, it would seem that they have somewhat neglected one aspect of the problem —less immediate, but perhaps the gravest—the effects of unemployment on the rising generation. In order to fill the gap the Save the Children International Union (Geneva) undertook during the past winter an inquiry confined to certain countries. It has just published its first findings in the pamphlet being reviewed.

The countries considered in this first part are Belgium, Germany, the United States and Switzerland. It is not a question of statistics but, rather, of a presentation of facts from the human and the humane points of view, and certainly it makes disquieting reading, since it shows clearly the fact that, apart from the physical detriment caused to children by the malnutrition following the reduction of weekly budgets, grave and immeasurable mental and moral detriment is being inflicted on children and adolescents—on each child, on each adolescent, according to individual temperament. One special point clearly emerging is that continued unemployment leads to a disruption of family life, without which sound social cohesion is not possible. Under such conditions that cripple body and mind, what sort of next generation may one expect? Is it already too late to attack the problem?

In future parts conditions in other countries will be considered, in particular those in Great Britain, where at the present moment careful inquiries are being carried out by a special *ad hoc* committee, under the auspices of the Save the Children Fund and the presidency of Lady Hall, and with the collaboration of competent authorities, medical officers of health, teachers, social workers and others.

Correction of Defective Speech: A Complete Manual of Psychophysiological Technique for the Treatment and Correction of the Defects of Speech. By Edwin Burket Twitmyer, Ph.D., and Yale Samuel Nathanson, Ph.D. Price, $3.50. Pp. 413. Philadelphia: P. Blakiston's Son & Co., 1932.

The authors offer a technic for the correction of all faulty types of mutilation of speech from faulty articulation and persistent baby talk to profound stuttering, with provision for cases of difficulty in speech from local deformation of the organs of speech as well as from deafness and foreign accent, for the improvement of the general output of speech and for the treatment of persistent allied disorders such as tics, gestures and a large variety of other peculiarities.

Most of the book consists of material for the training of speech, said to be arranged so that each new sound (the sounds being divided into continuants and stops) is introduced in proper relation to sounds already learned, and no new sound appears in the exercises until the teaching and learning of previous sounds have been accomplished.

This system of speech correction is based on the conception of the production of speech as dependent on correct breathing, correct "oratans" (defined as oral positions, representative of muscular imagery involved in speech) and a combination of these two. Although acknowledgment is made of the need for consideration of other, including psychologic, factors, there is no direct discussion of the problems of personality in relation to the correction of speech. The psychologic factor is apparently supposed to be managed indirectly through the system of speech correction with its speech material and technic. In spite of this defect, the system here offered deserves serious consideration and is the result of the considerable thought and experience of two earnest and intensive students of the disorders of speech. There is a good table of contents, but no index.

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Professor Taillens, Lausanne, Switzerland.
Secretary: Dr. P. Oltramare, rue Decandolle, Geneva, Switzerland.

International Pediatric Congress

President: Dr. George Frederic Still, 28 Queen Anne St., London, W. 1.
Secretary: Dr. Leonard K. Findlay, 61 Harley St., London, W. 1.

FOREIGN

Royal Society of Medicine, Section for the Study of Disease in Children

President: Dr. Leonard G. Parsons, 58, Calthorpe Road, Birmingham, England.
Secretary: Dr. W. G. Wyllie, 33, Wimpole St., W. 1, London.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman Dr. Alfred A. Walker, Highland Plaza Apartments, Birmingham, Ala.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Place: Cleveland. Time: 1934.

American Academy of Pediatrics

President: Dr. Samuel McC. Hamill, 1822 Spruce St., Philadelphia.
Secretary: Dr. C. G. Grulee, 636 Church St., Evanston, Ill.

American Child Health Association

President: Dr. Samuel McC. Hamill, 1822 Spruce St., Philadelphia.
Secretary: Dr. Philip Van Ingen, 125 E. 71st. St., New York.

American Hospital Association, Section on Children's Hospitals

President: Dr. Thomas B. Cooley, 7815 E. Jefferson Ave., Detroit.
Secretary: Miss Bena M. Henderson, 721 N. 17th St., Milwaukee.

American Pediatric Society

President: Dr. Charles A. Fife, 2104 Spruce St., Philadelphia.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid, St. Louis.
Place: Asheville, N. C. Time: May, 1934.

Canadian Society for the Study of Diseases of Children

President: Dr. Frederick F. Tisdall, 170 St. George St., Toronto, Ontario.
Secretary-Treasurer: Dr. T. G. H. Drake, 67 College St., Toronto, Ontario.

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*Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Society of Pediatric Research

President: Dr. Rustin McIntosh, College of Physicians and Surgeons, Columbia University, New York.
Secretary-Treasurer: Dr. Charles F. McKhann, Harvard Medical School, Boston.
Place: Atlantic City, N. J. Time: May, 1934.

SECTIONAL

Central States Pediatric Society

President: Dr. Julius H. Hess, 104 S. Michigan Ave., Chicago.
Secretary: Dr. A. H. Parmelee, 715 Lake St., Oak Park, Ill.
Place: Chicago. Time: Sept. 22-23, 1933.

North Pacific Pediatric Society

President: Dr. Herbert E. Coe, 509 Olive St., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. Hugh L. Dwyer, 406, W. 34th St., Kansas City, Mo.
Secretary: Dr. Luther W. Holloway, 117 W. Duval St., Jacksonville, Fla.
Place: Richmond, Va. Time: Nov. 14-17, 1933.

STATE

Alabama Pediatric Society

President: Dr. C. E. R. Parker, 401 S. Court St., Montgomery.
Secretary-Treasurer: Dr. John W. Simpson, 1117 S. 22d St., Birmingham.

Georgia Pediatric Society

President: Dr. Joseph Yampolsky, 311 Doctors Bldg., Atlanta.
Secretary-Treasurer: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Place: Atlanta. Time: October, 1933. Augusta. Time: May, 1934.

Louisiana State Pediatric Society

President: Dr. Cecil O. Lorio, 245, 3d St., Baton Rouge.
Secretary-Treasurer: Dr. Maud Loeber, 3503 Prytania St., New Orleans.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. Adolph G. De Sanctis, 12 E. 11th St., New York.
Secretary: Dr. George M. Retan, 459 James St., Syracuse.

Nebraska Pediatric Society

President: Dr. W. O. Colburn, 724 Sharp Bldg., Lincoln.
Secretary-Treasurer: Dr. C. G. Weigand, 1614 Medical Arts Bldg., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

North Carolina Pediatric Society

President: Dr. J. Buren Sidbury, 15 N. 5th St., Wilmington.
Secretary: Dr. E. K. McLean, 121 W. 7th St., Charlotte.
Place: Various children's hospitals. Time: Twice a year.

OKLAHOMA STATE PEDIATRIC SOCIETY

President: Dr. Clark H. Hall, 117 N. Broadway, Oklahoma City.
Secretary: Dr. M. J. Searle, 108 W. 16th St., Tulsa.

SOUTH CAROLINA PEDIATRIC SOCIETY

President: Dr. J. I. Waring, 77 Rutledge Ave., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, Medical Bldg., Florence.

TEXAS PEDIATRIC SOCIETY

President: Dr. Sidney R. Kaliski, Moore Bldg., San Antonio.
Secretary-Treasurer: Dr. Frank M. Martin, 321 Medical Arts Bldg., San Antonio.

VIRGINIA PEDIATRIC SOCIETY

President: Dr. J. B. Stone, 2042 Park Ave., Richmond.
Secretary-Treasurer: Dr. Thomas D. Jones, Medical Arts Bldg., Second and Franklin Streets, Richmond.

WEST VIRGINIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

President: Dr. R. C. Hood, 428 W. Pike St., Clarksburg.
Secretary: Dr. Russell C. Bond, 1325 Chapline St., Wheeling.

LOCAL

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. C. W. Burhans, 14805 Detroit Ave., Lakewood, Ohio.
Secretary: Dr. J. A. Garvin, 2009 Adelbert Road, Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

President: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Secretary: Dr. Lawrence Murray, 1870 Bloor St., W., Toronto.

BRONX PEDIATRIC SOCIETY

President: Dr. Edward L. Benjamin, 2021 Grand Concourse, New York.
Secretary: Dr. Harry M. Schapiro, 1882 Grand Concourse.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Every Second Wednesday of each month, except June, July, August and September.

BROOKLYN PEDIATRIC SOCIETY

President Dr. Carl H. Laws, 12 Pierrepont St., Brooklyn.
Secretary: Dr. Lewis A. Koch, 62 Pierrepont St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

CENTRAL NEW YORK PEDIATRIC CLUB

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

CHICAGO PEDIATRIC SOCIETY

President: Dr. Charles Schott, 48 W. Division St., Chicago.
Secretary: Dr. Bert I. Beverly, 8 S. Michigan Ave., Chicago.
Place: City Club. Time: Third Tuesday of each month.

Dallas County Pediatric Society

President: Dr. P. E. Luecke, 4105 Live Oak St., Dallas, Texas.
Secretary: Dr. R. S. Usry, 1835 Garrett Ave., Dallas, Texas.
Place: Bradford Memorial Hospital. Time: 1 p. m., first and third Saturdays of each month.

Detroit Pediatric Society

President: Dr. Bernard Bernbaum, 5057 Woodward Ave., Detroit.
Secretary: Dr. Sarah S. Schooten, 5057 Woodward Ave., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Roger W. Dickson, 33 Ponce de Leon Ave., N. E., Atlanta.
Secretary: Dr. T. I. Willingham, 384 Peachtree St., Atlanta.
Place: Academy of Medicine, 32 Howard St. Time: Second Thursday of each month from October to April, 8 p. m.

International Pediatric Society

President: Dr. Barnet E. Bonar, 9 Exchange Pl., Salt Lake City, Utah.
Secretary-Treasurer: Dr. Edwin R. Murphy, 9 Exchange Pl., Salt Lake City, Utah.
Place: Salt Lake City, General Hospital. Time: First Thursday of each month, 8 p. m.

Memphis Pediatric Society

President: Dr. R. B. McCormick, 1074 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. D. Mims, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. Karl E. Kassowitz, 709 N. 11th St., Milwaukee.
Secretary: Dr. John H. Reynolds, 747 N. 27th St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New England Pediatric Society

President: Dr. Thomas A. Foster, 131 State St., Portland, Maine.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Martha Wollstein, Babies' Hospital of City of New York, New York.
Secretary: Dr. Harry Bakwin, 132 E. 71st St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northern California Pediatric Society

President: Dr. Loyd Hardgrave, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Roland P. Seitz, 490 Post St., San Francisco.

Northwestern Pediatric Society

President: Dr. Irving McQuarrie, Dept. Pediatrics, University of Minnesota, Minneapolis.
Secretary: Dr. Alexander Stewart, 459 Lowry Medical Arts Bldg., St. Paul.

Philadelphia Pediatric Society

President: Dr. Joseph Stokes, 159 W. Coulter St., Philadelphia.
Secretary: Dr. James E. Bowman, 4091 Comly St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. Henry C. Flood, 119 S. Highland Ave., Pittsburgh.
Secretary: Dr. E. R. McCluskey, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months from October to April, inclusive.

Richmond Pediatric Society

President: Dr. F. Waring Lewis, Professional Bldg., Richmond, Va.
Secretary-Treasurer: Dr. A. S. Hurt, Jr., 2618 Grove Ave., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: First Thursday of each month (except July, August and September).

Rochester Pediatric Society

President: Dr. S. W. Clausen, Strong Memorial Hospital, Rochester, N. Y.
Secretary: Dr. F. W. Bush, 29 N. Goodman St., Rochester, N. Y.
Place: Arranged by program committee. Time: Second Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. J. A. Schoonover, Republic Bldg., Denver.
Secretary: Dr. Arthur L. Esserman, Republic Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7 p. m.

St. Louis Pediatric Society

President: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Secretary-Treasurer: Dr. Katherine Bain, Beaumont Bldg., St. Louis.
Place: St. Louis Medical Society. Time: Third Friday of every month.

Seattle Pediatric Society

President: Dr. Albert S. McCown, 509 Olive St., Seattle.
Secretary: Dr. Frank H. Douglass, Medical-Dental Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. James E. Harvey, 60 S. Lake Ave., Pasadena, Calif.
Secretary: Dr. E. Earl Moody, 3780 Wilshire Blvd., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Gustave F. Weinfeld, Moraine Hotel, Highland Park, Ill.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor Mich. Time: November, 1933.